Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

_____ _____

Jasmine Elle Kelly Date

Formative research for the development of a theory-based social behavior change communication plan for the More Milk in Tanzania (MoreMilkIT) project

By Jasmine E. Kelly

Rollins School of Public Health
Department of Behavioral Sciences and Health Education

_____

Karen Andes, PhD.

Committee Chair

_____

Amy Webb Girard, PhD.

Committee Member

_____

Colleen McBride, PhD.

Department Chair

Formative research for the development of a theory-based social behavior change communication plan for the More Milk in Tanzania (MoreMilkIT) project

By

Jasmine Kelly

Bachelors of Art
Vanderbilt University
2016

Thesis Committee Chair: Karen Andes, PhD

An abstract of a thesis submitted to the Faculty of the Rollins School of Public Health of Emory University in partial fulfillment of the requirements for the degree of Master of Public Health in Behavioral Sciences and Health Education
2018

Abstract

Formative research for the development of a theory-based social behavior change communication plan for the More Milk in Tanzania (MoreMilkIT) project

By: Jasmine Kelly

Malnutrition is a problem throughout the world, disproportionately affecting impoverished, rural, and vulnerable populations.[1] Tanzania is not spared the effects of malnutrition, as almost 90% of the population is located in rural regions[2] and 30% of the population is classified as food insecure.[3,4] Rural Tanzania relies heavily on livestock for nutritional and economic security.[5] Research suggests that livestock keeping in East Africa holds potential for economic growth,[6] that can be environmentally and culturally sensitive,[7] with specific benefits to highly vulnerable populations such as women and children.[8] The More Milk in Tanzania project seeks to use advanced value-chain development to improve livelihoods through focused livestock and dairy production and sale.[9] This research was conducted as the formative research for a social behavior change communication (SBCC) plan to supplement the More Milk project implementation, specifically to improve maternal and child nutrition through animal sourced foods. Formative research was grounded in a combination of three theoretical frameworks, the COM-B model[10] the Theoretical Domains Framework,[11] and the Designing for Behavior Change methodology of a barrier analysis.[12] The formative research was conducted in Masatu, Tanzania in the district of Handeni. A mixed-methods barrier analysis consisted of 51 doer/non-doer surveys, nine key informant interviews, and four focus groups. Doer/non-doer surveys measured characteristics and behavioral domains of mothers who did and did not complete selected behaviors. Behaviors of interest included those recommended by the WHO for adequate maternal nutrition for fetal development and infant and young child feeding practices.[13-21] Qualitative data collection consisted of conversation about community issues, program participation, community eating habits, and perceptions of the selected maternal and child nutrition behaviors. Several key determinants of behavior were identified including, access to resources, such as time, money, and food, socially normalized support from important family members, such as husbands and older female relatives, and both perceived positive/negative consequences and barriers/facilitators to maternal and child nutrition behaviors. Major themes such as perceived insufficient milk and consumption discrepancies between pregnant and lactating women and infants and children also arose. Using these results, this research lays the groundwork for a theory-based SBCC plan to improve maternal and child nutrition.

Formative research for the development of a theory-based social behavior change communication plan for the More Milk in Tanzania (MoreMilkIT) project

By

Jasmine Kelly

Bachelors of Art
Vanderbilt University
2016

Thesis Committee Chair: Karen Andes, PhD

A thesis submitted to the Faculty of the Rollins School of Public Health of Emory University in partial fulfillment of the requirements for the degree of Master of Public Health in Behavioral Sciences and Health Education
2018

ACKNOWLEDGEMENTS

I'd like to acknowledge Dr. Karen Andes, for her feedback and support as my thesis chair. The Emory, SUA, and ILRI teams, for their help in compiling the tools, training enumerators, conducting the fieldwork, translating, transcribing, brainstorming and friendship. Dr. Joyce Kinabo, Dr. Akwilina Mwanri, and Dr. Paula Dominguez-Salas, for their insight, advice, mentorship, support and review of many materials, incredible research minds, and reliable mobilization skills. Finally, Dr. Amy Webb Girard, for her relentless support of me and trust in my abilities, along with her wealth of knowledge and excitement for inquiry, constant willingness to teach and inspire, and for always being willing to have meetings or respond to my numerous emails. I'd also like to thank Emory University, specifically Rollins School of Public Health and the Department of Behavioral Science and Health Education and the Hubert Department of Global Health for allowing me to have the opportunity to engage with this research and benefit from an incredible learning experience.

TABLE OF CONTENTS

FIGURES AND TABLES

FIGURES

TABLES

INTRODUCTION

Malnutrition is widespread throughout lower-income, middle-income, and higher-income countries. As the second target of the second Sustainable Development Goal,[23] "end hunger, achieve food security and improved nutrition and promote sustainable agriculture,"[23] malnutrition is viewed as a serious yet solvable issue in the world. According to FAO, malnutrition is measured by stunting, a chronic state of undernutrition resulting in hindered growth in height, and wasting, an acute process of inadequate nutrition resulting in severe weight loss or weight gain.[1] In a global effort to reduce hunger and its resulting health consequences, scientists and food economists search for effective means of intervention. Like any other public health crises, hunger and malnutrition are embedded in a web of socio-determinants, such as cultural contexts, environmental landscapes, and political climates, making vertical solutions unsustainable long-term. By understanding the context and determinants of poor health outcomes, public health workers, medical professionals, and international aid organizations can more effectively target and help eliminate the underlying problems of hunger and malnutrition.

One potential solution is the incorporation of nutrition-sensitive programming. Nutrition-sensitive interventions help to address the underlying causes of malnutrition, rather than treating the symptoms alone.[24] Evidence for nutrition-sensitive interventions is mixed, but generally shows better outcomes than nutrition specific interventions alone.[25,26] Currently, most nutrition-sensitive programs adopted the label later in their implementation and were not designed with the framework in mind.[25] Therefore, thoughtful design followed by careful evaluation in the frontier of theory-based nutrition-sensitive interventions is paramount.

This project seeks to conduct the formative research for a theory-based social behavior change communication plan that will address maternal and child nutrition in a rural and predominantly agricultural area of Tanzania. Behavioral scientists agree that simple actions can result in poor health outcomes, but that many factors can influence an individual's behavior. By anchoring a social behavior change communication plan to a theoretical and empirical framework, the plan becomes both understandable across a range of settings while also staying inextricably linked to its intended context. This process is depicted in **Figure 1**. Using a strategy similar to the Designing for Behavior Change approach,[12] several behaviors were selected as key to intervention for the reduction of maternal and child malnutrition. Using the barrier analysis methodology, key determinants of these behaviors were identified. The determinants were then mapped onto the Theoretical Domains Framework[11] and simplified down to the COM-B model,[11] which stands for the capabilities, opportunities and motivation to behavior. From there, intervention functions can be identified and applied to the Behavior Change Wheel.[10] In turn, the Behavior Change Wheel helps to identify and address the context of the intervention functions. With all of these steps, a social behavior change communication (SBCC) plan can be formed. This SBCC will then contribute to the MoreMilkiT project, an advanced value-chain development project which is a type of nutrition-sensitive intervention. In addition to improving maternal and child nutrition, MoreMilkiT seeks to address poverty, access to means of production, strengthening economic engagement opportunities, cultivate livelihood independence, etc.

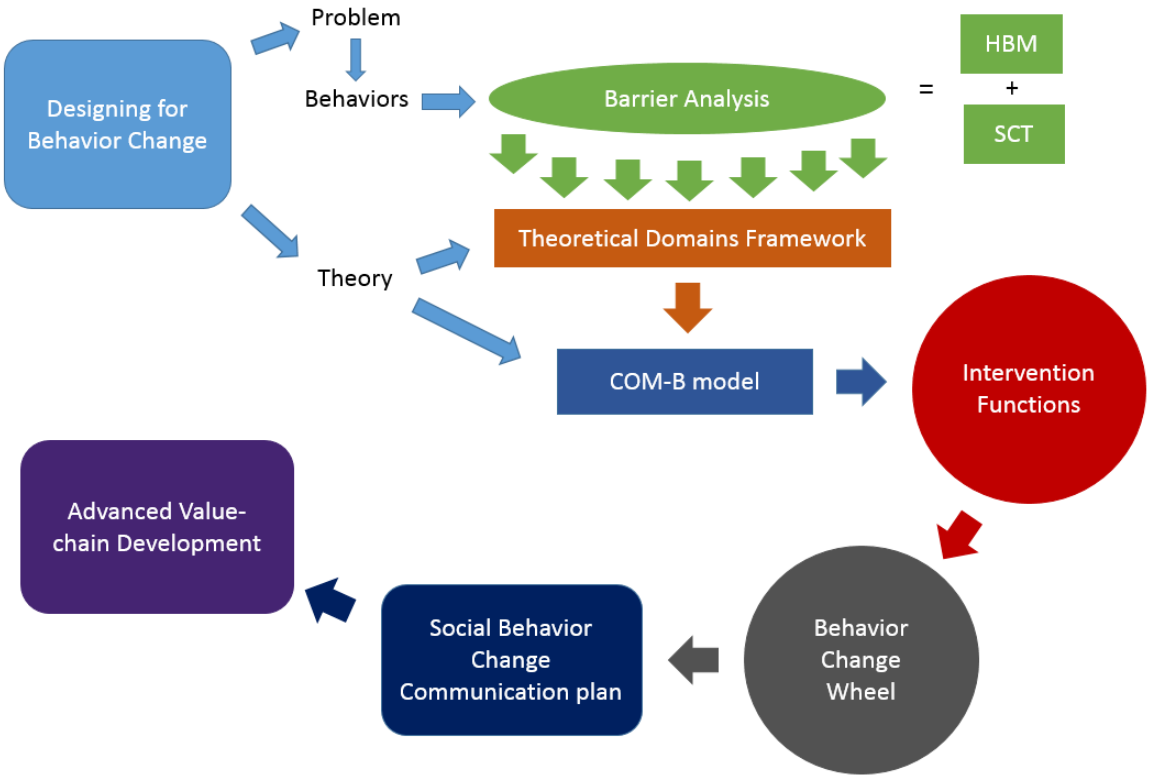


Figure 1. Visual of the process of the formative research using a barrier analysis and theoretical application to create an SBCC to ultimately contribute to the MoreMilkiT project.

When designing for behavior change, the first step is to identify a problem and the behaviors that contribute to said problem.[12] In this effort to improve maternal and child nutrition, fourteen behaviors have been identified as crucial. These behaviors are categorized by life-stage of the fetus/child, each with important implications for nutrition: pregnancy, 0-6 months, 6-12 months, and 12-24 months. The behaviors are as follows:

1. Mother consumes one extra meal during pregnancy
2. Mother consumes one extra cup of milk during pregnancy
3. Mother consumes at least five food groups per day during pregnancy (diverse diet)
4. Mother exclusively breastfeeds the child for the first six months
5. Mother consumes one extra meal while breastfeeding

6. Mother consumes one extra cup of milk while breastfeeding
7. Mother consumes at least five food groups each day while breastfeeding (diverse diet)
8. Infants 6-12 months consume three meals per day
9. Infants 6-12 months consume at least four food groups per day (diverse diet)
10. Animal milk is boiled each time before feeding to child
11. Children 12-24 months consume four meals per day
12. Child 12-24 months consume at least four food groups per day (diverse diet)
13. Child 12-24 months consumes one extra cup of milk each day
14. Mother continues to breastfeed until child is at least 24 months

Diet practices and consumption patterns during these four stages are important in similar yet independent ways. The nutritional and health implications of this will be discussed further in the review of literature.

Concurrently, it is important to establish a theoretical base that the behaviors can be matched with to form the intervention functions. The Theoretical Domains Framework (TDF) was created by a set of behavior experts that sorted an original 112 theoretical constructs into 12 behavioral domains.[11] This set of domains was tested using several validation methods, and created to address a wide array of potential barriers to behavior.[27] The 12 domains were then mapped onto the COM-B model. The COM-B model illustrates how capabilities and opportunities affect motivations which ultimately affect behavior, as shown in **Figure 2**. Capabilities are made up of psychological and physical, opportunities consist of social and physical, and motivation is comprised of reflective and automatic.[10] **Figure 3** shows the association between COM-B and TDF.

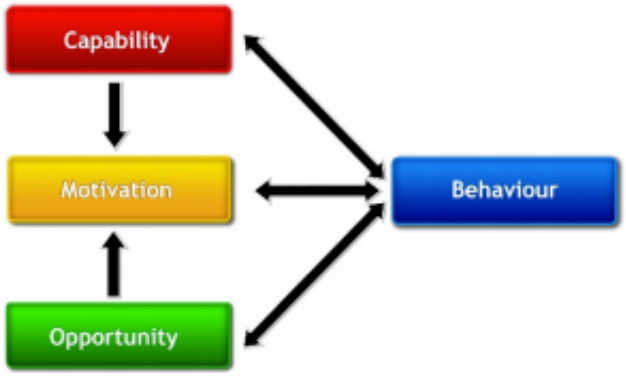


Figure 2. The COM-B model.[i] Adapted from: Michie S, Atkins L, and West R 2011.[10]

COM-B component		TDF Domain
Capability	Psychological	Knowledge
		Skills
		Memory, Attention and Decision Processes
		Behavioural Regulation
	Physical	Skills
Opportunity	Social	Social Influences
	Physical	Environmental Context and Resources
Motivation	Reflective	Social/Professional Role & Identity
		Beliefs about Capabilities
		Optimism
		Beliefs about Consequences
		Intentions
		Goals
	Automatic	Social/Professional Role & Identity
		Optimism
		Reinforcement
		Emotion

Figure 3. Theoretical Domains Framework mapped onto the COM-B model. Adapted from Cane J, O'Connor D, Michie S 2012.[11]

[ii] Letter from the publisher located in **Appendix I**.

The barrier analysis methodology also has its own set of behavioral domains formulated from a combination of the Health Belief Model[28] and Social Cognitive Theory.[29] These domains are systematically compared through the analysis to produce determinants of each behavior. The behavioral domains of the barrier analysis are: self-efficacy, perceived advantages or positive consequences, perceived disadvantages or negative consequences, perceived facilitators, perceived barriers, social norms, perceived social support, social approval, social disapproval, access to resources, ques to action, perceived susceptibility, perceived severity, and action efficacy.[30] For ease of interpretation, these domains have been mapped onto the TDF/COM-B models and shown in **Figure 4**. While not all the barrier analysis domains fit perfectly with the TDF/COM-B, the overlay still helps frame how the barrier analysis will produce useable information for the creation of intervention functions.

COM-B Model		Theoretical Domains Framework	Barrier Analysis Domains
Capabilities	Psychological	Knowledge	Ques to action
		Skills	Self-efficacy
		Memory, Attention, and Decision Processes	Action efficacy, PR/PS
		Behavioral Regulation	
	Physical	Skills	
Opportunities	Social	Social influences	Social approval/disapproval, social support
	Physical	Environmental Context and Resources	Resources
Motivation	Reflective	Social/Professional Role & Identity	Social norms
		Beliefs about Capabilities	Self-efficacy, Facilitator/Barriers
		Optimism	
		Beliefs about Consequences	Advantages/Disadvantages
		Intentions	
		Goals	
	Automatic	Social/Professional Role & Identity	Social norms
		Optimism	
		Reinforcement	
		Emotion	

Figure 4. Barrier analysis domains as applied to the TDF/COM-B model.

As depicted in **Figure 1**, the determinants of each behavior as identified in the barrier analysis and framed by the TDF and COM-B frameworks, will then serve as the building blocks for practical intervention functions. These intervention functions will then be applied to the Behavior Change Wheel to identify appropriate context-specific intervention plans. The Behavior Change Wheel (BCW) was compiled from 19 previous frameworks of behavior change, which were identified by its authors as not fully comprehensive. As shown in **Figure 5**, the wheel extends outwards from the central theory, COM-B, maps on the theoretical intervention functions, then surrounds the inner-circles in the larger social, political, and environmental contexts. These are essential for consideration when constructing a behavior change plan.

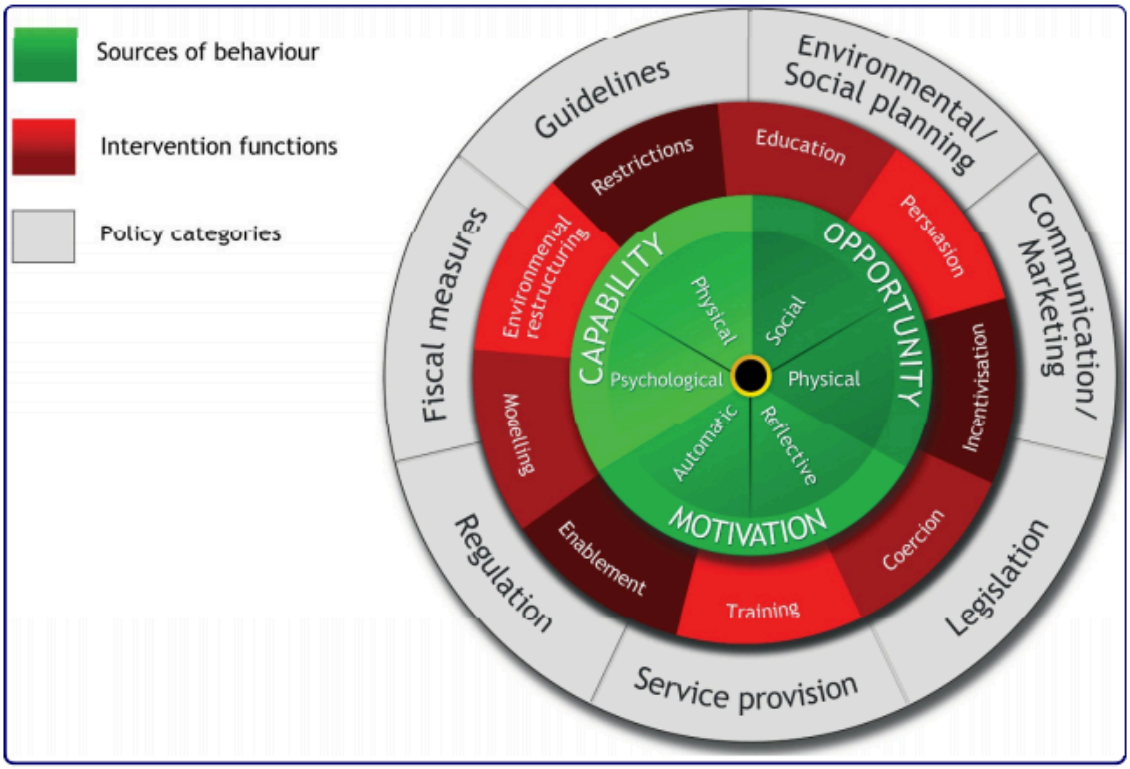


Figure 5. The Behavior Change Wheel. [ii] Used with permission from: Michie S, Atkins L, and West R 2014.[10]

[ii] Letter from the publisher located in **Appendix I**.

The end goal of this formative research is to create a theory-based social behavior change communication plan for the MoreMilkiT project. Therefore, the overall research objectives include:

1) **Identify the barriers and facilitators to optimal maternal and child nutrition, especially as it relates to dairy intensification and animal source foods production, safety and consumption, including relevant knowledge, attitudes and practices of different household members, available household resources, community assets and influencers**.
2) Understand how food, milk and economic security shift seasonally and implications on diets, workloads, time allocation and income, especially women's work loads and caring capacity of children and food-related decision-making as well as hygiene and sanitation practices that may increase risks of exposure to animal feces / zoonotic illness.
3) Document how the level of women's empowerment affects nutrition by focusing on e.g. decision-making processes and power dynamics in households as related to gendered roles and responsibilities in dairy management; the sale, purchase and consumption of animal source foods; and intra-household allocation of these and other foods.
4) **Identify preferred, acceptable and potentially effective community based delivery platforms for the SBCC strategy including to but not limited to community based groups, media (TV/radio programming), health facilities or schools, and the most effective format of message delivery.**

Due to the scope and ongoing nature of this research, this thesis will only focus on objectives one and four. Data from objectives two and three will help bolster the findings from this report, but were not available in time to be included here.

REVIEW OF LITERATURE

Poverty and Malnutrition

As of 2017, approximately 815 million people are undernourished globally.[1] Despite the steady global improvement of both nutrition and agricultural production overtime, disproportionate amounts of poverty and malnutrition still affect certain regions and, within these regions, rural areas in particular.[31] As an example of this, Tanzanian GDP has grown by 6.6% over the period of 1998 to 2007,[32] yet despite overall growth in GDP and agricultural production, rural Tanzania has seen little change in terms of poverty alleviation or nutritional improvement.[33] This gap may be explained by the ongoing rapid expansion of urban areas juxtaposed with an overall stagnation of economic progress in rural areas.[33] The differences in income between rural and urban people of Tanzania is notable, especially considering how urban influxes increase demand for rural agricultural and livestock products.[34]

The government of Tanzania recognizes that poverty is a predominantly rural phenomenon, especially given that over 87% of its population resides in rural areas.[2] It is also understood that poverty disproportionately affects agricultural households,[2] despite the aforementioned increase in agricultural production and overall GDP. In response, the National Livestock Policy, passed in 2006, acknowledges the importance of Tanzanian livestock economies in increasing food security and providing sustainable incomes for

households,[6] based on the fact that urban influx increases demand for rurally based agricultural and livestock products. Perhaps most importantly, the livestock sector represents not only an economic pathway to reduced poverty and improved nutrition, but it occupies an important space in many Tanzanian cultures.[7]

As a product of issues of poverty, malnutrition and childhood stunting is rampant in poorer parts of Tanzania.[35] Approximately 30% of the country is classified as food insecure.[3, 4] According to FAO in 2015, undernourished peoples in East Africa were projected to increase from 118.7 million between 2010-2012 to 124.2 million between 2014-2016.[31] It is no surprise that malnourishment disproportionately affects those most vulnerable in a society, especially women and children. In 2016, 3.32 million children under five were classified as stunted, a prevalence of approximately 35%.[36] The European Commission for International Cooperation and Development projects the number of stunted children in Tanzania to increase by 1.55% by 2025.[36]

Livestock in Tanzania

Livestock production plays a key role in meeting nutritional requirements,[34,35,37] as well as providing potential economic gains.[34] According to the 2007-2008 National Sample Census of Agriculture, 55,929 Tanzanian households supported themselves through livestock alone,, with an additional 3,917 acting as traditional pastoralists.[5] On top of that, the census found 2,224,410 households also kept livestock in addition to crop-based agriculture.[5] This equals 40.03% of the total households in Tanzania keeping some form of livestock.[5] The impressive numbers of livestock-keeping households reflects the potential for livestock to play a pivotal role in improving household nutrition.

Household livestock production often provide families with animal sourced foods (ASF). Animal source foods provide many micronutrients otherwise difficult to obtain by plant-based diets alone.[38] These micronutrients include: vitamin A, iron, zinc, calcium, riboflavin, and vitamin B12.[38] Lack of such nutrients often results in malnutrition and a myriad of poor health outcomes. In addition to added nutrition with access to animal sourced foods, households also benefit economically from livestock-keeping. Research suggests that livestock not only provide household income through selling of products at markets and through local vendors, but also provide an economic buffer to external shock and produce useable manure to aid in crop production.[38]

However, presence of livestock and other animals can also be detrimental to children's health and nutrition. Animal feces in and around the compound can cause environmental enteropathy; a subclinical condition of the gastrointestinal system that results in damage to the intestines that prevents proper nutrient absorption.[39] This disorder is caused from repeated fecal-oral contamination and ultimately stunts the intestines villi, small projections in the intestine designed to absorb nutrients and break down food, and causes severe inflammation.[39] One of the most notable impacts of environmental enteropathy is on malnutrition.[39] When environmental enteropathy has taken place, the body cannot absorb the necessary nutrients. This is why many nutrition interventions that do not consider water, sanitation, and hygiene can fail.[39-41] Due to these biological complications, studies on the benefits of livestock keeping on measurements of malnutrition are not always conclusive.[42,43] This suggests that nutrition interventions in agricultural contexts must take animal management strategies and water, sanitation, and hygiene practices into account.

With this in mind, research has shown that improvement of livestock and agricultural practices can be developed into nutrition-sensitive interventions.[25] Nutrition-sensitive interventions are those that consider and affect the underlying determinants of nutrition, including poverty, food insecurity, inadequate access to water, sanitation, and hygiene, etc.[24] These interventions help to address some of the underlying barriers to adequate nutrition, creating systematic and holistic changes as opposed to more vertical intervention models. Specifically, livestock and other agriculture-based development interventions have shown promise in their ability to improve income, diet diversity, food security, and women's empowerment.[25] Momentum in this strategy is increasing, as models of supplementation and fortification alone are proving inadequate.[26] However, more research is needed on the topic, as most reviews state that evaluation of such livestock and agriculture integrated interventions are too few to establish any direct effect on nutrition outcomes.[25,26,44] Despite this, evidence for the promise of improving determinants of nutrition through livestock and agricultural development using nutrition-sensitive interventions is strong.[25,26,44]

Livestock also play an important role in the livelihoods of women, especially in lower-income contexts. In contexts where it is difficult for women to own property, ownership of livestock can help to buffer against women's relatively little economic control.[8] Livestock represent an asset that can be bought and cultivated in times of surplus, and sold in times of hardship.[8] Aside from the nutritional benefits to women and the household, ownership of livestock give women bargaining power and control over financial decisions.[8] However, little research exists about the divisions of labor, assets, and

decision-making within the household, as most data compared male-headed and female-headed households.[8]

Allocation of certain foods within the household can further exacerbate the effects of inadequate access to nutritious foods. Specifically, many cultures show preference to adult men over women by perpetuating social norms surrounding who can eat what in the household.[45] Ethnography in Tanzania shows that social relationships and beliefs can often make the difference between diet and health outcomes between households of similar socioeconomic status due to allocation practices.[46] Therefore, nutrition sensitive interventions that address women's empowerment and child feeding practices may be particularly effective.

Importance of Behaviors on Nutrition

Each behavior of interest mentioned in the introduction was chosen because they are recommended by the WHO as the standards for infant and young child feeding practices and proper nutrition for pregnant and lactating women.[13,16,18,21,47,48] These standards are designed and tested to ensure the best health and nutrition for mothers and babies. Exclusive breastfeeding is the act of feeding a baby only breastmilk until the age of six months. Six months is the target age because at this age clinical trials show there is no detriment to the baby, such as malnutrition or dehydration, and it reduces death from infection.[20] The World Health Organization recommends exclusive breastfeeding until the age of six months, then introduction of complementary foods increasing in thickness, size, and amount of meals as the child gets older.[15] From here, the WHO then recommends supplemental breastfeeding until the child is at least two years old.[15] Adequate dietary

diversity during pregnancy ensures that the fetus will receive proper nutrients and that the mother will remain healthy during her pregnancy. The standards for maternal dietary diversity is consumption of food from five or more food groups per day, and is four for children.[49,50] The groups are also slightly different between adults and children, as children have fewer groups in total. Maternal dietary goals also include specific recommendations for pregnant and lactating women to consume extra calories, vitamins, and protein to make up for the loss of nutrients, achieved through increased food consumption and adequate dietary diversity, in addition to iron and folic acid or multiple micronutrient supplementation .[19]

Advanced Value Chain Development: Maziwa Zaidi and MoreMilkIT

A value chain is a map of the life course of a product. These maps depict the stages products undergo from pre-production, or design, to consumption, as shown in **Figure 6**. Each stage is complex and involve many stakeholders, from those who produce input materials, to those who market and sell products, to the consumers themselves and the demands they place on the market. **Figure 6** depicts a simple four-step value chain wherein products transition from design to production, then to marketing and consumption.

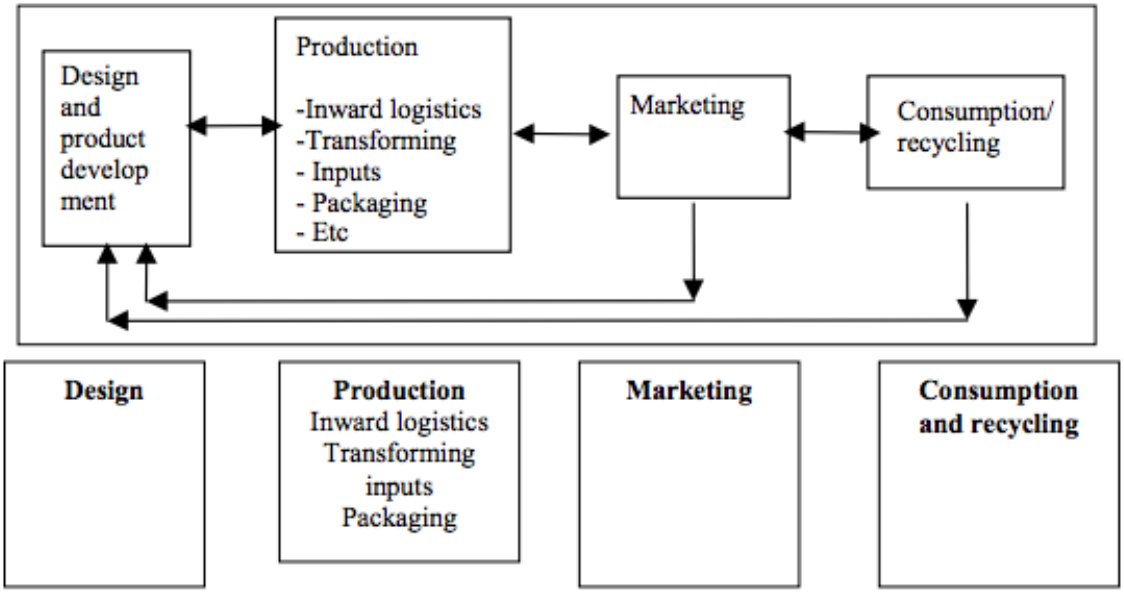


Figure 6. Simple value chain. Adapted from: Kaplinsky R, Morris M 2001.[22]

Advanced value-chain development (AVCD) is a strategy used to increase the salience, desirability, or impact of a product or market.[22,51] It is a useful tool for incorporating poor consumers into a necessary market or bolstering a struggling yet important market, such as for nutritious agricultural products battling effects of climate change and food chain globalization. This process works by increasing both supply for and demand of a product, therefore incorporating unique and interconnected interventions along each step of the value chain. For nutritional products, these value chains become even more complex, as many inputs are involved at each level and several are less than controllable for local producers and consumers (i.e. weather, international imports).[51] In a smaller and more closed system, such as local, rural livestock and dairy production, actors in the value chain are even more highly connected. This is the case because in a local context, those producing the product are often consuming it themselves while also selling

to others. Therefore, these more enclosed food systems, such a local livestock markets, are more vulnerable to compounded effects from external disruptions.

Dairy advanced value chain development is especially important for the rural Tanzanian context for all of the aforementioned reasons, nutritional necessity of animal sourced foods, economic opportunity for livestock keepers and vulnerability of local markets, and cultural appropriateness of a livestock focus. Dairy products, especially liquid milk, can be seen as a form of "cash-crop" rather than just a by-product of livestock.[52] While the true impact of livestock-keeping livelihoods on women's well-being is not well understood, evidence is building that dairy intensification may improve women's empowerment,[52] as well as maternal and child nutrition. Therefore, evidence supports the inclusion of dairy-specific value-chain advancement within the larger context of livestock advanced value chain development.

Currently, the ongoing livestock value-chain enhancement project in Tanzania is called Maziwa Zaidi.[53] Among this larger project, the MoreMilkIT project specifically focuses on enhancing the dairy value-chain.[9] Importantly, this model deviates from previous attempts to recreate Western dairy chains, which focus on industrial production, pasteurization, and packaging.[53] A different approach is taken because Western dairy chains tend to provide economic and nutritional benefits mainly to wealthier members of society. Maziwa Zaidi focuses on brining benefits to family-level livestock owners, small-scale buyers and sellers, and local markets. The overall goal of Maziwa Zaidi is to reach "inclusive and sustainable development of smallholder dairy value chain by 2023."[53]

Social Behavior Change Communication (SBCC)

To create a successful advanced value-chain development strategy, consumer behavior must be a primary focus. Frequently, providing a service or product is not enough to ensure consumers will use it.[54] Thus, a more comprehensive approach to promote behavior uptake may be necessary. Social behavior change communication (SBCC) is an important component of the dairy advanced value chain development project, MoreMilkIT. As a strategy for creating sustainable and impactful behavior change, social behavior change communication is a crucial step along the overall dairy value chain improvement strategy; shown here in **Figure 7**.

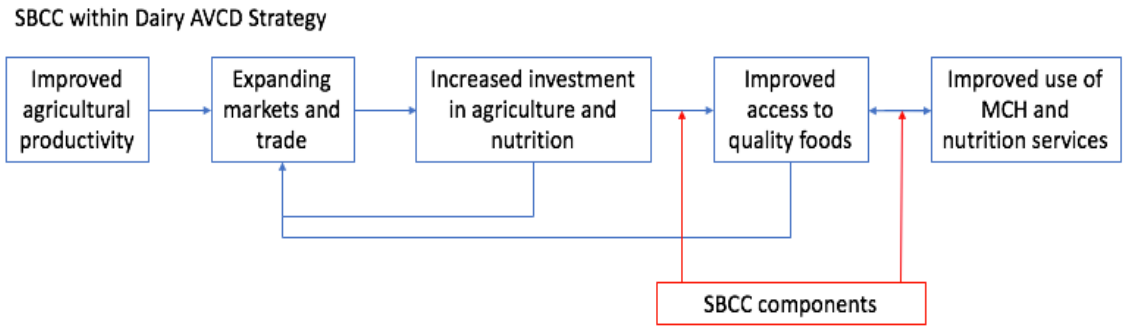


Figure 7. Depiction of dairy AVCD steps with SBCC

A successful SBCC strategy in this context needs to identify barriers and facilitators to all important behaviors associated with maternal and child nutrition and dairy. Barriers and facilitators are pieces of behavioral domains that can help or hinder individuals from successfully learning, completing, and maintaining a behavior.[55] The target of this SBCC plan is to promote optimal maternal and child nutrition and milk hygiene behaviors, focusing on ASF consumption by women of reproductive age and children over 6 months old.

METHODS

Formative research for the SBCC strategy consisted of a barrier analysis conducted in tandem with supplemental qualitative research. Both data collection methods were written with children under two years as the primary beneficiaries, and mothers, fathers, and grandmothers as the potential target audiences for the SBCC strategy. The qualitative tools were used to compliment quantitative barrier analysis methods through triangulation of respondent answers to better understand strategies for effective and sustainable behavior change.

A barrier analysis is a methodology that focuses on identifying factors that hinder a behavior or facilitate a behavior.[30] These key barriers and motivators are associated with the capabilities and opportunities that influence motivation, as addressed in the COM-B model. The barrier analysis asks participants about several determinants of behavior completion. These determinants are domains of behavior, such as social norms, self-efficacy, and ques to action, that influence or block an individual from a behavior. By assessing these key determinants, the barrier analysis can identify where individuals are most hindered and inform evidence-based programming to address those areas. This methodology works by surveying a group of people and identifying "doers" and "non-doers" of a behavior. As their name suggests, doers are people who have completed the behavior of interest within a given amount of time. For example, someone that got a flu shot in the past year would be a doer. A non-doer, in contrast, is someone who did not complete the behavior of interest for any reason. This eliminates any self-identification into a group. For example, if a person smokes one cigarette but they do not identify as a smoker, they may assign themselves to a non-smoker category if asked whether or not they smoke. However, we are interested in their behaviors, not their perceived identity. So instead the

question would perhaps be, "Have you smoked any cigarettes in the last year?" Then, assessments of the key determinants or behavioral domains are compared between doers and non-doers to identify where there is overlap and discrepancy. This helps to identify true factors that differentiate those that do and do not adhere to a behavior.[30]

This formative research was situated within a larger project addressing research objectives 2 and 3. These objectives were met using a combination of qualitative interviews and focus groups and quantitative market and diet information. Seasonality of foods and women's empowerment information was gathered through interviews and focus groups. Market and diet data were collected through quantitative market surveys using Cost of the Diet software, measuring costs of foods by price and seasonality. Animal management and sanitation data were collected through a combination of interview and focus group data along with in-person observations of animal management practices.

Overview of Tools

Doer/Non-doer Surveys

A barrier analysis was conducted using Doer/Non-Doer surveys. Doer/Non-doer surveys were subdivided into four categories based on the age of respondents' child of interest. Categories included 1) pregnant women, 2) women with a child between 0 and 6 months old, 3) women with a child between 6 and 12 months old, and 4) women with a child between 12 and 24 months old. Behaviors of interest differed between each category based on previous literature stating healthy standards for infant and young child feeding and maternal health.[14,15,19] In total, the doer/non-doer survey had 14 behaviors of interest (**Table 1**).

Table 1. Breakdown of D/ND behaviors of interest by respondent category.	
D/ND Category	**Behaviors of Interest**
Pregnant Women	1. Increased food intake during pregnancy 2. Increased milk intake during pregnancy 3. Increased diet diversity during pregnancy
Child 0-6 mos	1. Exclusive breastfeeding for six months 2. Increased food intake while breastfeeding 3. Increased milk intake during breastfeeding 4. Increased diet diversity while breastfeeding
Child 6-12 mos	1. Feeding infant three meals per day 2. Feeding infant a diverse diet 3. Boiling animal milk before each feeding
Child 12-24 mos	1. Feeding child four meals per day 2. Feeding child a diverse diet 3. Feeding child extra serving of milk per day 4. Continued breastfeeding

Using the barrier analysis framework,[30] each survey category and behavior of interest consisted of items measuring perceptions of varied behavioral domains. These domains included: self-efficacy, perceived advantages and disadvantages, perceived facilitators and barriers, social norms, perceived social support, social approval, social disapproval, perceived access to resources, cues to action, perceived susceptibility, perceived severity, and action efficacy. Additionally, respondents were identified as either a "doer" or a "non-doer" for each behavior of interest using doer/non-doer assessment questions. Doer/Non-doer assessment questions were targeted to identify whether a respondent practiced a behavior of interest at time of participation or not, labeling them

either a "doer" or a "non-doer." Doer/Non-doer assessment of diet diversity required counting the number of food groups eaten in the previous 24 hours. An adult eating five or more food groups and/or feeding a child four or more food groups was identified as a "doer."

Possible response types included doer/non-doer indicator, Likert scale, and open-ended. Doer/Non-doer assessment questions include responses such as, yes/no/don't know, more/less/the same amount, calculated number of food groups eaten etc. Likert scale responses measured difficulty, likelihood, and seriousness of each corresponding behavior or outcome. For example, responses could include, "Very likely," "Somewhat likely," and "Not likely at all" to adhere to a behavior. Open-ended questions required respondents to name specific people or factors as barriers and/or facilitators to action. For example, answers for these questions could include, "Mother-in-law," "Husband," or "Myself." See **Table 2** for example survey items and corresponding response types.

Table 2. Example D/ND survey items by behavioral domain with corresponding response type.

Behavioral Domain	**Example Survey Item**	**Response Type**
Doer/Non-doer Assessment	While breastfeeding, will you drink more, less, or about the same amount of milk as you would if you were not breastfeeding?	More/Less/The same Yes/No/Don't know Food group calculation
Self-efficacy	Considering your knowledge about diet in pregnancy, the resources and skills you have and your family support do you think that you would be able to take an extra cup of milk each day during this pregnancy?	Yes/No/Don't know
Perceived advantages		Open-ended

	What do you think are advantages of *taking more milk while pregnant?*	
Perceived disadvantages	What do you think are the disadvantages or negative consequences of *taking more milk while pregnant?*	Open-ended
Perceived facilitators	What makes it easier to *take more milk while pregnant?*	Open-ended
Perceived barriers	What makes it difficult for you to *take more milk while pregnant?*	Open-ended
Social norms	Would most of the people that you know approve of your *taking more milk while pregnant*?	Yes/No/Don't know
Social enablers	Whose support do you need to be able to *take more milk while pregnant*?	Open-ended
Social blockades	Who are all the people that would disapprove of your *taking more milk while pregnant*?	Open-ended
Perceived access to resources	How difficult is it / would it be to get the resources needed to *take more milk while pregnant every day*?	Likert scale - Difficulty
Cues to action	How difficult do you think it is/ would be to remember to *take more milk while pregnant every day*?	Likert scale - Difficulty
Perceived susceptibility	In your opinion what do you think are the chances that you might *develop anemia (weak blood) during this pregnancy*?	Likert scale - Likelihood
Perceived severity	How serious would it be for you to *develop anemia (weak blood) during this pregnancy*?	Likert scale - Seriousness

Behavioral pathway	In your opinion what are the chances you might *develop anemia if you did not eat from five or more food groups each day while pregnant*?	Likert scale - Likelihood

In addition, each survey contained a demographic section and a food security section. Demographics sections were comprised of questions ascertaining respondent's age, occupation, level of education, number of children, number of people in household, head of household, head of household's occupation, head of household's level of education, etc. Food security questions were based on the Household Hunger Scale[56] (HHS) and measured the presence and severity of household food insecurity over the past 30 days. The food security section was comprised of between three and six items, assessing first presence of food insecurity and then severity of insecurity. For example, an item might say, "In the past 30 days, was there ever no food to eat of any kind in your house because of lack of resources to get food?" If respondents answered yes, then a potential follow up would be, "How often did this happen in the past 30 days or since this time last month?"[56] Answers are then coded as The Household Hunger Scale is a globally validated metric of food security measured by relatable and universal experiences of food insecurity, namely hunger.[56] Because of the universality of the HHS items, specifically the realities associated with experiencing hunger, it tends to measure severe instances of food insecurity.[57] The more nuanced constructs of food insecurity are more difficult to measure accurately across contexts, and therefore are not included in the HHS.[57] This means that even the seemingly low-scoring households would score higher on a context-specific scale, and therefore are experiencing a grave amount of food insecurity.

Qualitative Instruments

Qualitative data collection was used to expand upon surveys and observations for in-depth triangulation of the barrier analysis. Qualitative methods included focus group discussions and key informant interviews. Focus group protocols were created for each population of interest including, pregnant and lactating women (PLW), fathers, and grandmothers. Each protocol touched on themes that were most applicable to the knowledge of the participants. See **Table 3** for themes covered in each focus group guide.

Table 3. Focus group guide themes by respondent group.

Themes	**Grandmothers**	**Fathers**	**PLW Group A**	**PLW Group B**
Ideal caregiver	X	X	X	
Diet diversity	X	X		X
Mealtime practices	X	X		X
IYCF behaviors	X	X		X
Animal management	X	X	X	
Program participation	X	X	X	
Milk hygiene				X
Sources of advice				X

Key informant interview guides were semi-structured in nature and split between community level leaders and ministry staff. Both guides collected demographic information such as the respondent's name, position, number of years in said position, gender, and age. Major themes of the community leaders interview guide included "current programming activities," "contributors to program success," and "animal management." The ministry staff interview guide covered the same themes with the addition of "policy and guidelines."

Data Collection

Field Training

Enumerators consisted of Sokoine University of Agriculture students, faculty, and affiliates, along with ministry livestock officials and animal scientists. All enumerators were Tanzania-born and were native Kiswahili speakers. Some enumerators also spoke local languages such as Maasai and Zigua. All enumerators were experienced in survey administration and qualitative data collection. However, due to the large number of tools and heavy behavioral focus, enumerators received additional training from the Emory University team. The Emory University team consisted of professors and Master's candidates. Along with Tanzania enumerators, the Emory team reviewed the COM-B model, Theoretical Domains Framework, and Behavior Change Wheel as they related to the doer/non-doer surveys. In addition, the Emory team reviewed focus group and interview themes and objectives. Both teams came to consensus on how to phrase questions for best understanding of participants, while maintaining the true objectives of each question.

Once tools were finalized, a field pilot test was conducted in a nearby village with close connections to the field team. Enumerators conducted each focus group and several doer/non-doer surveys. All standard data collection protocol was followed, along with incentives for participants, proper data management, and data entry. All tools were finalized after debriefing and discussion of the pilot test. All data collection took place in Masatu village of Hendeni district in northeastern Tanzania.

Doer/Non-Doer Surveys

Survey respondents were recruited through purposive sampling using gatekeepers as points of access to the community. Since the participant inclusion criteria were so specific (i.e. the four respondent categories), community leaders were utilized as gatekeepers to help identify eligible women. The team expected to collect surveys from ten women from each of the four respondent eligibility categories (i.e. pregnant women, women with a child 0-6 months, women with a child 6-12 months, and women with a child 12-24 months), summing to a goal of forty women in total.

All surveys were conducted following the reading and signing of a consent form, stating that the participants' information would be kept confidential, de-identified, and stored in an encrypted folder. Following the survey, participants were compensated for their time.

Surveys were administered by enumerators and all answers were translated into English at the time of completion. Each survey lasted approximately 20-50 minutes, depending on the length of answers and participants ability to speak Kiswahili. Immediately following each survey administration, answers and consent forms were

collected by an Emory team member and tracked using a data tracking form. Data were entered into Microsoft Excel on a rolling basis by Emory team members, and were uploaded to the Emory Box after entry. After each day of data collection, the whole team debriefed on tool successes and challenges, and made changes to tools and administration technique as necessary.

Qualitative Data

Sampling of focus group discussion participants was also conducted using a purposive strategy with an additional snowball procedure. Community leaders were, again, utilized as gatekeepers to the community and informed the team of eligible and potentially interested participants. Additionally, once those participants were contacted, they were able to provide names of other eligible and potentially interested participants. Four focus groups were conducted, two with a combination of pregnant and/or lactating women, one with grandmothers, and one with fathers. Pregnant and lactating women included women who were actively pregnant and/or breastfeeding. Grandmothers included women over the age of 50 with at least one grandchild. Fathers included men with at least one child. These criteria were chosen because inputs from women and men of reproductive age, and potentially influential family members, specifically older female relatives such as mothers and mothers-in-law. Each focus group had approximately ten participants, who were from a mixture of ethnic groups and were predominantly Muslim.

Each focus group was conducted following the reading and signing of a consent form, stating that the discussions would be recorded and that participants' information would be kept confidential, de-identified, and stored in an encrypted folder. During

discussion, participants were provided a beverage and/or snack, and following the focus group participants were compensated 5,000 Tanzanian shillings for their time.

Each focus group was conducted in Kiswahili by an experienced enumerator, and lasted approximately 60 to 90 minutes. One additional enumerator was in attendance to take notes and assist with focus group activities. Enumerators able to translate from different local languages were available in case of need for additional translation. Group activities required supplies such as flipcharts and markers. All focus group discussions were recorded using handheld recording devices. Immediately after recording, audio files were stored on an Emory team member's computer and then uploaded to the Emory Box.

Key informant interviews were conducted in a similar fashion to focus group discussions. Key informants were recruited through convenience sampling. One district official was contacted in advance and asked to notify other community leaders about an opportunity to receive feedback on previous work. The team held a community feedback meeting on the first day of fieldwork, and spoke with approximately 25 community leaders. These leaders included government officials, religious leaders, elected community officials, community elders, and other important people in the community.

From this group, the team inquired which leaders would be willing to participate in an interview for approximately 60 to 90 minutes. Of these leaders, nine were willing and eligible to participate. Similarly to the focus group discussions, participants were told the risks, benefits, and requirements of participating. The leaders were also compensated similarly for their time. Key informant interviews were also recorded and were accompanied by a note-taker. None of the key informant interviews needed an additional Kiswahili translator.

Additionally, immediately following focus group discussions, enumerators transformed their notes into structured detailed summaries. By expanding upon their notes and listening to the audio, enumerators assigned the note-taker role constructed detailed accounts of the setting, participants, responses, themes, body language, general disagreement or consensus, and outcomes of group activities along with pictures. Detailed summaries were then reviewed by other team members and expanded upon further in areas that lacked detail.

Analysis

Doer/Non-Doer Surveys

After survey data were entered into an excel spreadsheet, answers were tabulated by "doers" and "non-doers." Those designated as doers were given a separate column to those of non-doers. Then, each closed-ended behavioral measure was counted and compared. For open-ended answers, similar responses were grouped based on meaning. A running account of how each answer was categorized was kept in detail in addition to the tabulation. For example, answers such as "the baby will be big" and "the baby will grow" were categorized under "Growth of baby." These answers were tabulated by question. For example, all positive consequences were tabulated separately from negative consequences. Therefore, "Growth of baby" could have possibly been an answer for both positive and negative consequences of consuming more food during pregnancy with a different frequency of responses. From there, groups of tabulated answers were then grouped into themes. Themes were comprised of groups of answers that fit into the same content category and resulted in the same implications. For example, vomiting and diarrhea were

grouped together into the theme of "illness," and aunts and grandmothers were grouped into the theme "older female relatives." Grouping by theme was conducted due to the large range of responses and small number of respondents. Themes also allowed for better triangulation between surveys and focus groups.

Differences between responses of doer and non-doers were analyzed statistically using the Guide to Conducting a Barrier Analysis and supplemental tabulation analysis materials.[30] Differences in responses for doers and non-doers were calculated using estimated risk ratios for each respondent category and behavior of interest. Due to a low number of respondents for each category, a p-value of 0.15 was selected. While this p-value may not represent true statistical significance, because the overall total of respondents was low, it suggests strong potential for intervention when confirmed through triangulation with qualitative data.

Additionally, using the Household Hunger Scale survey, respondents were categorized as having either "severe," "moderate," or "little to no" food insecurity in their household. All responses indicating no hunger were coded as 0. From there, all subsequent responses indicating "rarely" or "sometimes" were coded as 1, and "often" were coded as 2. Scores for each household were then totaled, with scores ranging from 0-6. "Little to no" food insecurity scores ranged from 0-1, "moderate" food insecurity ranged from 2-3, and "severe" food insecure households ranged from 4-6. All eating habits questions of the Doer/Non-Doer surveys were summed and averaged per household and per respondent category. This included number of meals eaten, number of snacks eaten, number of servings of milk per day, etc.

Qualitative Data

Prior to analysis, detailed summaries were collected, de-identified, and formatted. One primary data analyst preformed analysis using MAXQDA qualitative analysis software.[58] Each summary was read, memoed, and open-coded to form general themes and classify inductive information. During open-coding, the primary coder constructed a preliminary codebook comprised of inductive codes on the themes identified and several deductive codes based on important research objectives. Upon refinement of the initial codebook, the primary coder completed a second round of coding and applied the codes to all of the summaries. This process was completed with the focus group discussions separately from the key informant interviews, as they had different codebooks.

Thematic analysis was used for focus group and key informant interview summaries, which was then used to triangulate with Doer/Non-doer findings. The primary researcher used code summary tables, complex coding queries, and MAXMAPS to develop several conceptual frameworks.[58] From there, these summarized findings were compared to themes generated from the doer/non-doer surveys and marked each time they arose. The focus group codebook was made so each behavior and each behavioral domain was clearly labeled.

RESULTS

Sociocultural Context

Demographics

Descriptive statistics were performed on demographic results along with diet diversity, milk consumption, meal frequency, household hunger from the doer/non-doer

surveys to provide an overview of respondent characteristics. **Tables 4** displays doer/non-doer respondents' demographic information. From a total of 51 respondents, women averaged around 30 years old, had on average three children each, and lived in households with approximately six to seven people.

Respondents represented several ethnic groups, however the majority were from the Zigua tribe, 76.5% (n=39). The second and third most common tribes were Pare with 7.8% of respondents (n=4), and Sambaa with 5.9% (n=3). The majority of respondents had a primary school education, with 52.9% (n=27) having completed primary and 29.4% (n=15) having attended some primary. Regarding occupation, most respondents participated in some form of cultivation, with 54.9% (n=28) purely crop-farming as a livelihood and 25.5% (n=13) participating in mixed crop-farming and livestock-keeping. Livestock most commonly included cattle, goats, and chicken. Most women were either monogamous marriages, 58.8% (n=30), or single, 23.5% (n=12). Most respondents had other family members living in the household; 32.0% (n=16) had a non-parental female (i.e. a sister, child, or aunt) and 29.4% had a non-parental male (i.e. brother, child, or uncle). The great majority of respondents claimed their husband as head of their household, 70% (n=35), however several others claimed their fathers, 8% (n=4), mothers, 8% (n=4), or themselves, 8% (n=4) as head of their household. More heads of household completed primary education compared to respondents, with 13.3% (n=6) attending some primary and 73.3% (n=33) completing primary education. Occupation distribution amongst heads of household was similar to respondents, where 66.0% (n=31) were exclusively farmers and 25.5% (n=12) engaged in a mix of crop-farming and livestock-keeping as a primary livelihood.

Table 4. Frequencies and averages of demographic characteristics from doer/non-doer respondents.			
Demographics (N=51)			
		Mean	**Standard Deviation**
Demographic			
	Respondent age	29.86	7.82
	Number of children	3.16	1.82
	Household size	6.51	2.43
		Frequency (%)	**N = 51**
Tribe			
	Zigua	76.5%	39
	Pare	7.8%	4
	Other tribes[iii]	7.8%	4
	Sambaa	5.9%	3
Education			
	Never attended	9.8%	5
	Some primary	29.4%	15
	Completed primary	52.9%	27
	More than primary	7.8%	4
Occupation			
	Does not work	7.8%	4
	Crop-farming	54.9%	28
	Mixed livestock/crop-farming	25.5%	13
	Informal business trader	9.8%	5
	Other	2.0%	1
Marital Status			
	Married monogamous	58.8%	30
	Married polygamous	11.8%	6
	Divorced	5.9%	3
	Single	23.5%	12
Household structure			
	Mother in household	23.5%	12
	Father in household	13.7%	7
	Mother-in-law in household	14.0%	7
	Father-in-law in household	2.1%	1

[iii] Other tribes include: Luguru (n=1), Nyturu (n=1), Zaramo (n=1), and Bonde (n=1).

	Other female family	32.0%	16
	Other male family	29.4%	15
Head of household			
	Husband	70.0%	35
	Respondent or other female	19.6%	10
	Father or other male	9.8%	5
	Unclear	2.0%	1
HH Education			
	Never attended	6.7%	3
	Some primary	13.3%	6
	Completed primary	73.3%	33
	More than primary	4.4%	2
	Doesn't know	2.2%	1
HH Occupation			
	Livestock	2.1%	1
	Crop-farming	66.0%	31
	Mixed livestock/crop-farming	25.5%	12
	Informal business trader	4.3%	2
	Other	2.1%	1

Additionally, a Household Hunger Scale was administered and revealed high levels of food insecurity, as shown in **Table 5**. This information was collected from all doer/non-doer survey respondents, a total sample of 51 households.

Table 5. Household hunger scores calculated from the Household Hunger Scale.[56]

Household Hunger Scores		
Severity	**Proportion (%)**	**Households**
Little to no hunger (0-1)	70.6%	36
Moderate hunger (2-3)	27.5%	14
Severe hunger (4-6)	2.0%	1
Total	100%	51

While the scale indicates that 0 to 1 is “little to no hunger,” the prevalence of any hunger at all should not be taken lightly. Compared to other measures of food insecurity, the

Household Hunger Scale measures more extreme experiences of food security. Despite the terminology "little to no hunger," these households would comparatively rank as moderately to severely food insecure by other methods.[57] While most respondents fell into this category, a total of 70.6% (n=36), almost a third (n=15) of respondents reported experiencing at least moderate hunger.

Diet Diversity and Eating Habits

In addition to demographics, diet diversity, and number of meals, snacks, and milk, were counted from each household. **Tables 6** displays diet diversity of children and mothers. Diet diversity of children was collected from doer/non-doer respondents in the 6-12 months and 12-24 months categories, totaling 26 households. Diet diversity of mothers was collected from doer/non-doer respondents in the Pregnant Women and 0-6 months categories, totaling 25 households.

Table 6. Diet Diversity for infants and children as reported by their mothers, and diet diversity for mothers as reported by themselves during 24-hour diet recall. [14,59]

Diet Diversity – Child		
	Frequency (%)	**N=26**
Grains/Cereals	100.0%	26
Dark leafy greens/Vitamin A-rich	57.7%	15
Other fruits and vegetables	52.0%	13
Beans/legumes/nuts/seeds	42.3%	11
Dairy	26.9%	7
Eggs	0.0%	0
Meat	23.1%	6
% consuming four or more food groups[iv]	34.6%	9
Diet Diversity – Mother		

[iv] Children reaching adequate diet diversity is measured by consumption of food from four or more different foods groups in the last 24 hours. This measure includes infants (6-12 months old) and children (12-24 months old).

	Frequency (%)	N=25
Grains/Cereals	100.0%	25
Vitamin A-rich	24.0%	6
Dark leafy greens	56.0%	14
Other vegetables	32.0%	8
Other fruits	12.0%	3
Beans/legumes	40.0%	10
Nuts/seeds	8.0%	2
Dairy	20.0%	5
Eggs	0.0%	0
Meat	58.3%	14
% consuming five or more food groups[v]	24.0%	6

In the case of both women and their children, 100% (n=25, 26) consumed grains or cereals in the previous 24 hours. The second most commonly consumed food group for mothers was meat at 58% (n=14) of mothers eating meat in the previous 24 hours. Second to grains, children were most likely to eat dark leafy greens or vitamin-A rich foods at a 57.7% (n=15) consumption rate. For children's diet diversity, dark leafy greens and vitamin-A rich foods are combined into one food group.[49] Slightly more children consumed dairy products than their mothers, 26.9% (n=7) and 20.0% (n=5) respectively. Zero respondents claimed to have eaten eggs and none noted that they fed eggs to their children. Mothers were much more likely to consume meat, 58.3% (n=14), over their children, 23.1% (n=6). This is probably due to the age of the children and their ability to chew meat.

Lastly, **Table 7** below shows the distribution of milk consumption by infants and children. Milk consumption data were collected from respondents in the 6-12 months and 12-24 months categories, totaling 26 households.

[v] Adults reaching adequate diet diversity is measured by consumption of food from five or more different foods groups in the last 24 hours. This measure include data from pregnant mothers and breastfeeding mothers.

Table 7. Frequency of milk consumption of infants and children.[vi]		
Milk consumption		
	Frequency (%)	**N=26**
Less than once a month/never	57.7%	15
A few times per month	19.2%	5
A few times per week	11.5%	3
Once per day	8.3%	1
More than once per day	7.7%	2

Milk consumption for infants and children was low overall. Fresh milk includes drinking liquid milk and any milk includes milk in any form, either consumed alone or added to food or tea. Most women, 57.7% (n=15), claimed to give their infant or child milk less than once a month or never. In distant second, at 19.2% (n=5), women reported feeding milk to their infant or child a few times per month. Very few women provided milk to their infants or children a few times per week, 11.5% (n=3), once per day, 8.3% (n=1), or more than once per day, 7.7% (n=2).

Current Community Issues

Community issues were openly asked about to nine key informants. Thematic analysis using inductive and deductive investigation resulted in a spectrum of findings. Deductive topics included food insecurity, water sanitation and hygiene, and maternal and child nutrition. These topics revealed a set of mostly unanimous responses. Findings resonated with the results from the HHS in that food insecurity was said to be widespread, caused by drought and exacerbated by poor food storage. Food storage was a common theme, as three key informants mentioned it as a pervasive issue in the community.

[vi] These data were collected for infants (6-12 months old) and children (12-24 months old). Milk consumption included fresh milk, fermented milk, or milk served in tea or food.

One key informant specifically asserted that the homes in Handeni are too small to properly store food. Water, sanitation, and hygiene was said to be an issue in the community due to water scarcity. Several key informants noted that water was either unavailable or far away from the community. One key informant mentioned that sociocultural norms play a role in community adoption of soap for handwashing. This informant said, "In our Zigua culture, one has to smear the toilet along the pit opening using ash and at times hot water. Soap is not our tradition, and I can't lie here. I have to speak the truth." While this was only one person's perspective, it is evident that key informants believe utilization of soap and access to clean water could be improved. Opinions on maternal and child health were scarce. However, most key informants agreed that the mothers were the main actors in improving child health. One informant commented that women's workload was often the culprit for inadequate child feeding and nutrition. The informant claimed, "Within two to three weeks one should not be surprised to find a recently delivered mother back to the farm carrying the little one and often times working alone without the support of the husband."

Key informants almost unanimously named infrastructure, namely irrigation, as one of the biggest problems in the community. Many cited aging water pipes and frequent breaks as a reason for poor access to clean water. Almost every informant mentioned a failed irrigation project that will be discussed further in the program implementation section. One informant also mentioned recent improvements to roads that they hoped would continue with another ongoing community project. Conflict was only mentioned as a community issue once, and was stated to be between farmers and primarily pastoralist cattle-keepers over land disputes. Overwhelmingly, the biggest and most frequently

mentioned community issue was that of employment and poverty. Six out of the nine interviews mentioned much needed improvements to livestock keeping practices, and economically difficult livelihoods for livestock keepers. Several key informants explicitly mentioned unemployment and poverty as community issues, but most referred to economic hardships as a result of underproductive and dying herds and fields. Interestingly, the last inductive finding revealed four out of nine informants mentioning poor family planning as an issue in the community. These informants agreed that more education to men on pregnancy spacing would be useful and successive births limits women's ability to care for their children.

Triangulation of Behavioral Determinants

Doer/non-doer distributions for each behavior can be found below in **Table 8**. Most interestingly, increased food and milk for pregnant women had zero doers, suggesting that this is an uncommon practice in this community. In contrast, 100% of respondents were doers for the behavior continued breastfeeding until the age of two.

Table 8. Summary of doer and non-doer scores from surveys per behavior.

Doer/Non-Doer Surveys		
Behavior	**Doers**	**Non-Doers**
Increased food intake during pregnancy	0	12
Increased milk intake during pregnancy	0	12
Adequate diet diversity during pregnancy	3	9
Exclusive breastfeeding for the first six months	5	8
Increased food intake while breastfeeding	5	8
Increased milk intake while breastfeeding	1	12
Adequate diet diversity while breastfeeding	3	10
Feeding infant three meals per day	7	7
Feeding infant a diverse diet	3	11
Boiling animal milk before each feeding	9	5
Feeding child four meals per day	2	10

Feeding child a diverse diet	7	5
Feeding child an extra serving of milk per day	2	10
Continued breastfeeding	12	0

Between doer/non-doer surveys and focus group discussions, certain behaviors tended to group together. More specifically, during focus groups in particular, participants talked about some behaviors in the same way. For instance, diet diversity for pregnant and lactating women, consumption of extra milk during pregnancy and lactation, and consumption of extra food during pregnancy and lactation tended to be talked about in a similar fashion. Because of this, some of the triangulation, and therefore determinants, for specific behaviors was overlapping.

The first group of behavioral determinants stemmed from *increased and adequate food, milk, and dietary diversity of pregnant women*.[vii] These were the first three behaviors and were assessed from doer/non-doer surveys of pregnant women in the community (n=12) and focus group discussions. Doers of increased food and milk intake during pregnancy both were 0% (n=0), and doers of adequate diet diversity, meaning five or more food groups, was 25.0 % (n=3). Behavioral determinants identified as they relate to the COM-B model are reflected below in **Figure 8**. As aforementioned, there were no doers of increased food or milk during pregnancy. Unanimously across the surveys and focus group discussions, physical opportunity, specifically lack of access to resources, was a major barrier to performing these behaviors. Lack of resources included money to buy food or milk, access and availability of diverse and nutritious food, cattle to produce milk, and sufficient harvests. When asked about their ability to perform these behaviors, lack of

[vii] An example triangulation table is located in **Appendix II**.

resources was often cited as a reason for low self-efficacy. For instance, non-doers said they *would* be able to consume more milk during pregnancy "if milk is available." Those who had little to no self-efficacy for these behaviors cited, "lack of income," "lack of resources – no money to buy food," and "less availability due to lack of income and livestock." This suggests that physical opportunity can affect reflexive motivation, compounding the effects of lack of resources and poverty, as shown in **Figure 8**. Reduced harvest and cattle yields and lack of money were said to be strongly connected. The inability to work when pregnant, combined with poor performing harvests and cattle results in low income and reduced buying capacity of food and milk, in addition to reducing consumption of one's own agricultural products. Non-doers of adequate diet diversity in pregnancy were more likely to say that "lack of resources" was a barrier (p=0.091). Non-doers were also more likely to report little to no self-efficacy for reaching adequate diet diversity (p=0.091), citing the reasons, "because no money to buy other foods," and "lack of money." In addition to external resources, social support was incredibly important to the fulfillment of these behaviors. Husbands and older female family members, including mothers, mothers-in-law, grandmothers, and aunts, were the two most frequently cited influencer groups. Doers of adequate diet diversity during pregnancy were more likely to cite that their husbands approved (p=0.045), and that they needed help from an older female relative (p=1.59) than non-doers. Focus group conversations revealed a nuanced relationship between fathers, or husbands, and older female relatives, specifically grandmothers, and adequate diets during pregnancy. "Good fathers" were cited as those that provide resources to his wife while she is pregnant. The most highly valued trait of a good father is the ability and willingness to buy enough good food. He is expected to "know

the needs of his family [and make] sure there is enough food in the house." Specifically, one group mentioned,

> "[He should] ensure that his wife eats food that she has been advised to eat at the clinic during her pregnancy that will be good for the baby too, such as foods like fruits and vegetables, milk, eggs, and meat."

Similarly, "good grandmothers" were expected to contribute to the health and well-being of pregnant women. In contrast to providing resources, good grandmothers were expected to contribute time, energy, and knowledge to pregnant mothers by helping to cook and prepare proper food. Focus group participants said that good grandmothers "has to help [a pregnant woman] by preparing the food based on [the pregnant woman's] interest as they are so selective with foods, and encourage them to eat for the sake of the child and herself." In addition, knowledge from medical experts such as community health workers and clinic staff was an important source of information to mothers, grandmothers, and fathers. Participants overwhelmingly reported that these three behaviors result in positive consequences for the health of both mother and child. Doers were more likely to say that there were no negative consequences to eating a diverse diet while pregnant when compared to non-doers ($p=0.127$). Focus group participants agreed that increased food and milk intake along with adequate diet diversity helps to keep the mother healthy and strong. However, some respondents indicated that negative consequences of increased milk consumption include developing rashes, either on the mother or infant, and diarrhea. While positive consequences seemed to outweigh these negative outcomes, they were overshadowed by the pervasive barrier of lack of access to resources. Reflected in the diet diversity, food security, and milk consumption scores, and the doer/non-doer surveys, lack

of access to resources prevents mothers from completing these three behaviors. Lack of physical resources affects opportunity and also reflective motivation through views of self-efficacy, which is also reflected in **Figure 8**.

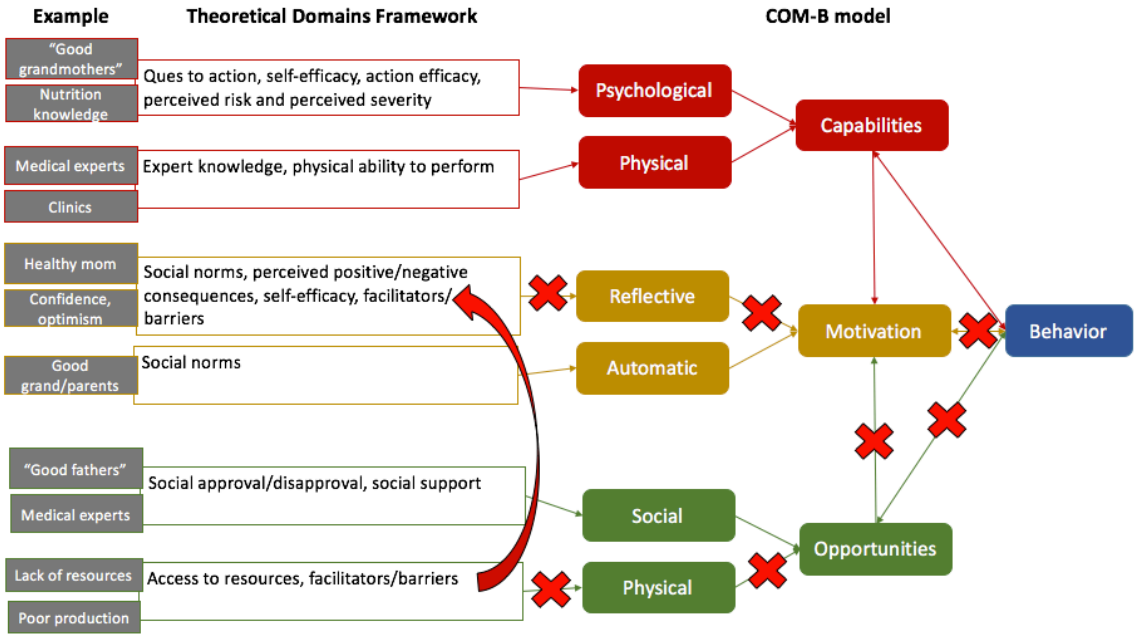


Figure 8. Behavioral pathway of increased food, milk, and adequate diet diversity for pregnant mothers as they influence capabilities, opportunities, and motivation. The grey boxes represent examples from the surveys and FGDs of specific themes identified by participants. [viii] Modified from: Michie S, Atkins L, and West R 2011.[10]

Figure 8 depicts a disconnect between opportunities, motivation and behavior. Because opportunity directly impacts motivation in this context, the consequences of poverty and lack of resources not only block physical opportunity, but also reflective motivation via self-efficacy and hopeless view of barriers.

The next set of behavioral determinants stem from discussions of *increased food and milk and adequate diet diversity for lactating women*. The determinants of these behaviors are inherently related to those for pregnant women, but also show some distinct

[viii] Letter from the publisher located in **Appendix I**.

differences. They were also assessed through doer/non-doer surveys (n=13) and focus group discussions. Doers of increased food consumption during lactation represented 38.5% (n=5) of the cohort, while doers of increased milk only represented 7.7% (n=1). Lack of access to resources remains a pervasive determinant in this group of behaviors, however it is not as prominent as for pregnant women. Interestingly, the number of women who consume extra food during lactation is much higher than the number of women who consume extra food during pregnancy, five to zero respectively. A lack of access to resources alone does not sufficiently explain this change. While this may be the case, both doers and non-doer continue to site lack of access to money, food, milk, and adequate yields as a major barrier to these behaviors. Doers were more likely to cite that they needed resources to consume extra food while lactating (p=0.119). Both doers and non-doers for increased milk and adequate diet diversity cited lack of resources as a barrier and resources as a facilitator so many times that the odds ratio and p-values could not be calculated (i.e. the number of responses outnumbered the total number of participants). Despite this overwhelming evidence from the surveys, barriers to consuming more and adequate food and milk did were not dominating answers from focus group participants. However, focus group participants agreed that adequate diet diversity and increased milk, specifically, held many advantages. For instance, the grandmothers responded that "foods such as milk, tea, chapatti, porridge, ugali, vegetables, fish, and chicken… helps to increase the mother's milk, prevent stomach pain and provide good health for both mother and child." Perceived negative consequences, again, were only discussed in length for increased milk consumption and risk of developing rashes or diarrhea. Similarly, focus group discussions mentioned that husbands and older female relatives were expected to provide support to

lactating women to increase their intake and adequacy of food. One group said, "[Lactating women] are supposed to eat all the food because they are now free and they need to be rewarded for their hard work." However, some participants mentioned that lactating women should avoid eating leftovers, as it can cause insufficient milk.

An explanation for the disproportionate citation of lack of resources as a barrier to increased food and milk consumption and adequate diet diversity for lactating women between survey respondents and focus group participants, may be the issue of perceived insufficient milk and its interaction with self-efficacy towards *exclusive breastfeeding*. Self-identified doers of exclusive breastfeeding occupied 38.5% (n=5) of the total 0-6 months cohort. Despite this, perceived insufficient breast milk arose as a barrier to exclusive breastfeeding amongst both survey and focus group participants. For focus group participants, perceived insufficient milk was cited as the primary barrier to exclusive breastfeeding, however data from the doer/non-doer surveys suggest a fear of insufficient milk is created by a lack of access to adequate food, milk, and diet diversity during lactation. As **Figure 9 shows**, most focus group conversation around lack of resources were in reference to perceived insufficient milk, as shown by the solid lines, which itself was the most predominantly cited barrier to exclusive breastfeeding. Doer/non-doer data, as shown by the dotted lines, suggest an added pathway between lack of resources as a barrier to exclusive breastfeeding, namely lack of adequate maternal food, milk, and diet diversity leading to perceived insufficient milk and lowered self-efficacy for the behavior of exclusive breastfeeding.

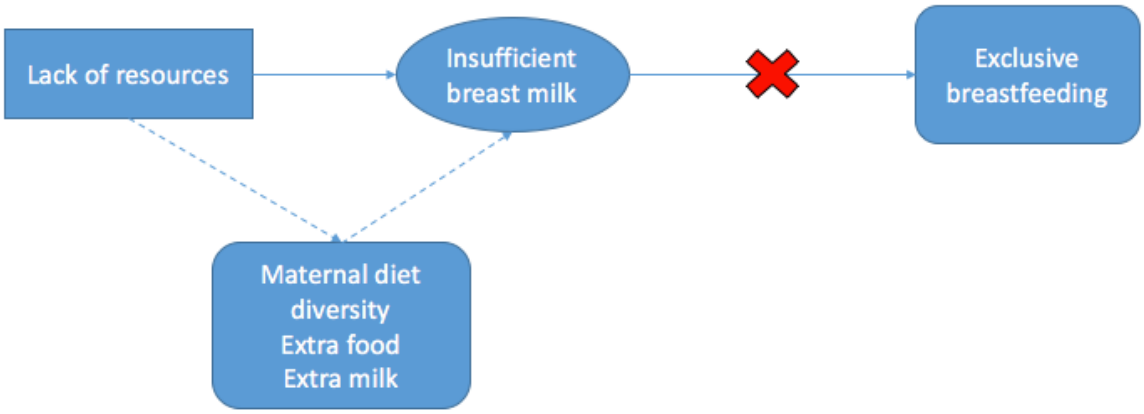


Figure 9. Diagram of insufficient milk as the barrier between adequate diet and exclusive breastfeeding. Solid lines represent what was shared by focus group participants. Dotted lines represent the same pathway through adequate nutrition behaviors for lactating women.

However, facilitators to exclusive breastfeeding were mother's adequate nutrition and/or resources to facilitate such nutrition. Members of one group noted,

> "When the mother [is] eating enough she can be able to produce enough milk for the child. [Eating enough comes] when having high income or when the family works hard they can earn money to buy food."

Insufficient milk was such a pervasive barrier to exclusive breastfeeding that it affected the motivations of doers to the same extent as non-doers. This was shown in the survey results, as the following examples explain. Doers were 9.69 times more likely than non-doers to say that a negative consequence of exclusive breastfeeding is an unhealthy child ($p=0.078$). The interpretation "unhealthy child" can include answers such as "poor health for baby," "child will get dehydrated," "child will be underweight," etc. These answers indicate a belief that exclusive breastfeeding is not sufficient nutrition for infants. Moreover, one self-identified doer of exclusive breastfeeding was counted as a non-doer after she explained to

the interviewer that the only reason she was exclusively breastfeeding was because her child was only three days old. Because of her intention to feed her baby water after one week, she was counted as a non-doer.

The factors of lack of resources influencing milk sufficiency impact both physical opportunity and physical capability, as breastfeeding is a biological process that the community perceives to be interrupted by inadequate nutrition. Interestingly, more non-doers reported that there were no negative consequences of exclusive breastfeeding ($p=0.049$). In addition to lack of resources and insufficient milk, mother's poor health was also seen as a significant barrier to exclusive breastfeeding. Specifically, HIV transmission risk hindered women from breastfeeding as much as they wanted. Doers were 19 times more likely than non-doers to say that good health of the mother would make exclusive breastfeeding easier ($p=0.07$). Several other barriers were mentioned by focus group participants and were corroborated by survey responses. One in particular was agreed upon fervently by the whole group, poor birth spacing. The group said, "a woman can deliver today and in [a] few months you can [hear] she is having another pregnancy." Both disease status, general health, and pregnancy status of a woman directly affects her physical capability to exclusively breastfeed, as depicted in **Figure 10**.

Exclusive breastfeeding also encounters interesting social dynamics in the community. As before, good fathers are expected to provide adequate resources for women to stay properly nourished and in turn produce enough milk for their children. Grandmothers, however, in addition to their previous expectation of helping around the house, are also sources of information on infant and young child feeding practices. Here there is a conflict between both reflective and automatic motivation and psychological

capability. Women in the focus groups say that medical professionals and parents/grandparents are the most sought-after advisors on exclusive breastfeeding. They agree that family advice is convenient and tempting to listen to, however can sometimes be incorrect or misleading. Participants said, "there [is] usually conflicting [advice] between the parents and the health center but they think they should follow the health center's advice because those people are specialized in issues of breastfeeding and to avoid conflicting advice between family members and doctors." They go on to note, "Family advice, even if they prefer it, should be avoided because the family members are not specialized [in] issues related to health and infant feeding." It is also evident that medical professionals are correct, yet can be expensive and difficult to access. Focus group participants also identify good grandmothers as those who provide advice to pregnant and lactating women. Therefore, social roles and expert advice can cause a conflict in decision-making for lactating women. This represents another determinant of exclusive breastfeeding, accurate, and accessible information. Because grandmothers are the preferred source of information, they are invaluable for educating women on exclusive breastfeeding.

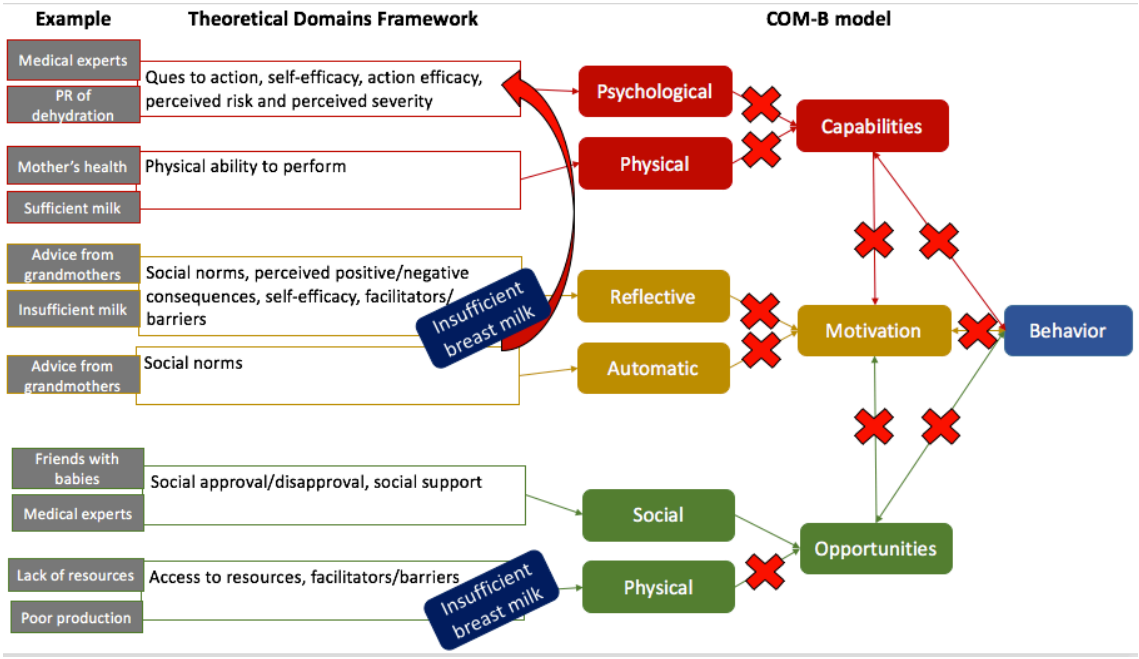


Figure 10. Behavioral determinants of exclusive breastfeeding as they influence capabilities, opportunities, and motivation. The grey boxes represent examples from the surveys and FGDs of specific themes identified by participants. [ix] Modified from: Michie S, Atkins L, and West R 2011.[10]

Figure 10 depicts the determinants of exclusive breastfeeding and how this behavior has many interactions to consider. The determinants to exclusive breastfeeding include access to resources as it influences sufficient milk production, accurate/non-conflicting information delivered in a socially acceptable and accessible manner, and physical health of the mother. The red arrow indicates the impact of strong social norms on psychological decision making, for instance the temptation to follow inaccurate advice from grandmothers over healthcare workers.

The next set of behavioral determinants stem from a combination and comparison of several behaviors. The first set of behaviors are *feeding an infant three meals each day and*

[ix] Letter from the publisher located in **Appendix I**.

a diverse diet, four or more food groups each day, assessed from surveys (n=14). The second set are *feeding a child four meals, a diverse diet, and an extra serving of milk each day* (n=12). These behaviors are distinct because, for our purposes, an infant is 6 to 12 months old and a child is 12 to 24 months old. This information is split for survey respondents, however, focus group participants did not make this distinction. Therefore, focus group contributions will use the term "child," as used by participants. Proportion of doers feeding an infant three meals each day was high, at 50.0% (n=7). At a lower representation, doers feeding infants a diverse diet was at 21.4% (n=3). Interestingly, doers for child (12-24 months) diet diversity was much higher at 58.3% (n=7). In a similar contrast, children receiving the recommended number of meals, four, was quite low at 16.7% (n=2). The differences between these behaviors at different ages may reveal important determinants. To start with adequate number of meals, three and four per day for infants and children respectively, lack of resources was once again a determinant. Lack of access to resources such as money to buy food, sufficient crop yields to consume or sell, and time to prepare several meals impact families' physical opportunity to feed an adequate number to their infants and children, as displayed in **Figure 11**. P-values could not be produced for either behavior because the number of responses for lack of resources as a barrier outnumbered the total respondents. One focus group discussed number of meals for children. Participants said for infants at six months, they feed three meals per day and can be given snacks several times per day. Participants added that they know the number of meals fed per day is supposed to increase as the child ages, however most mothers continue to feed at three meals per day "or they may feed them as many times as they come across food or something to eat." Additionally, both doer and non-doers of both behaviors agree

that the positive consequences of feeding an adequate number of meal is a healthy baby. Contradictorily, both doer and non-doers also claim that feeding three or four meals per day can cause illness and sickness including obesity, vomiting, and stomach bloating. Husbands and older female relatives were once again the most important sources of social support. In a similar fashion, good fathers were expected to provide adequate and nutritious food to children and good grandmothers were expected to help prepare nutritious food and advise mothers on how to properly feed their children. Focus group participants and survey respondents both identified child age as a significant determinant of ability to feed them a diverse diet. This is also reflected in the difference in diet diversity between children and their mothers in **Table 6**. Several focus group participants claimed that children younger than one year cannot eat meat. Again, lack of resources was cited as a serious barrier to feeding a diverse diet to either age. The focus groups revealed a general consensus on a lack of fresh fish, milk, meat, and eggs in the community. Both doers and non-doers indicated that a diverse diet for infants or children would result in healthy babies. Focus group participants agreed that there are foods they wished they could feed more often, like round potatoes, eggs, and millet porridge, because these foods "increase protection against child illnesses, children become healthy and increase in weight." Lastly, feeding an extra serving of milk to a child had a low frequency, with 16.7% (n=2) doing this behavior. In addition to the previously mentioned determinants, milk was specifically perceived to cause acute symptoms such as rashes and diarrhea. Focus group participants also asserted

that fermented milk is not given to children, only fresh milk. As with the other behaviors, extra milk for children was perceived as healthy overall, yet scarce and difficult to access.

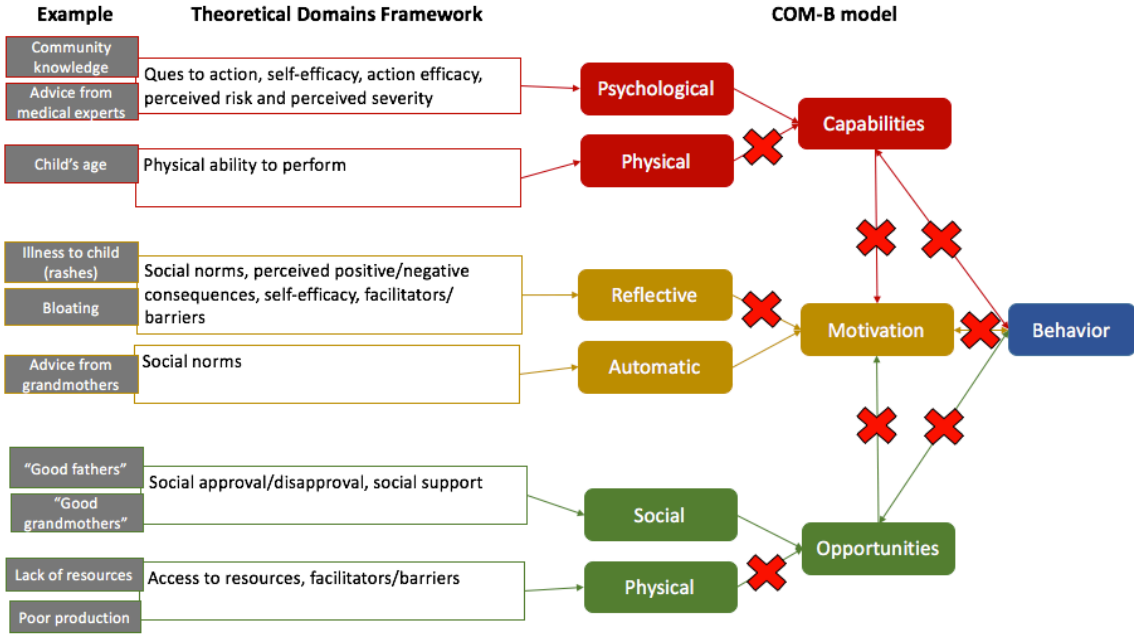


Figure 11. Behavioral determinants of adequate number of meals and diet diversity for infants and children as they influence capabilities, opportunities, and motivation. The grey boxes represent examples from the surveys and FGDs of specific themes identified by participants. [x] Modified from: Michie S, Atkins L, and West R 2011.[10]

Overall, the largest determinants, depicted in **Figure 11**, for all of these behaviors include access to resources as it related to physical opportunity, social norms for good fathers and grandmothers as it relates to social opportunity, age of the child and ability to chew reflected in physical capabilities, and pervasive perceptions of acute illness caused by giving milk to children following the reflective path to motivation.

The final two behaviors, boiling milk before each serving and continuous breastfeeding, are separated from the rest because their determinants are fairly straight forward. Both behaviors had high rates of doers, 64.3% (n=9) and 100% (n=12)

[x] Letter from the publisher located in **Appendix I**.

respectively. Knowledge about the need for boiling animal milk and therefore its perceived positive consequences were unanimous. Doers and non-doers both said that boiling milk eliminates harmful bacteria and prevents disease. Additionally, survey and focus group participants agreed that boiling milk also increases its shelf-life, which was seen as an additional benefit. However, some focus group participants did claim to boil milk once then only warm it each time before giving it to children. The strongest determinant of the ability to boil milk each time before serving for both survey and focus group participants was access to resources, including firewood or other fuel, having milk itself, pots and utensils to keep the milk in, and time to boil milk before each feeding. Several of the mothers responded with full knowledge of the importance of boiling milk, yet were still not classified as doers because they admitted to not fully boiling the milk each time. One focus group participant mentioned that boiling milk often can lead to a waste of milk as it boils off. In regard to continued breastfeeding, its perfect completion rate may help to bolster the importance of previously mentioned determinants. More than anything else, participants mentioned that continued breastfeeding was essentially a free supplement to their children's nutrition. Due to the pervasive lack of resources that undermines every intention, knowledge, or social support, continued breastfeeding is seen as an essential mechanism for ensuring adequate nutrition when other foods are scarce. Overall, these behaviors are also strongly determined by access to resources.

Program Implementation

Figure 12 below shows the four major themes associated with successful program implementation as identified by focus group participants: community engagement, addressing barriers, appropriate delivery, and effective leadership.

Figure 12. Conceptual framework depicting four themes of successful programming according to focus group participants. Thin lines indicate subcategories of a theme of successful programming. Thicker, red arrows indicate impacts and relationships between subcategories.

Community engagement was an important tenet raised by each group: women, fathers, and grandmothers. Unsurprisingly, each group emphasized the importance of their own demographic being appropriately engaged. Men made a passionate argument for their place in community programs. This desire for engagement is made stronger by the repeated connection between "good fathers" and community participation. Active participation in community groups and socialization was identified as one of the most important tenants of good fatherhood. In addition, the fathers acknowledged their feeling left out of some community projects that target women, and their belief that they can help to reinforce

content specific to women if they are also taught. For example, the summary from one conversation said, "…women have been taught all along but they do not adhere to the principles of exclusive breastfeeding, so if men are involved in the trainings this may help them to remind their wives."

Women also acknowledged some tension between men and women in regard to program participation. When asked what would help women participate in programs, they said, "…in order for a mother to participate [in a program] there should be involvement of mother and father into those programs, and this will help reduce conflict at home." A barrier to women participating in programs was their husbands. The women claimed in summary, "Some participants mentioned that it is difficult for them to participate in programs due to their husbands being jealous and therefore [they do] not allow them to join these programs. [The husbands] think that they are going to do other things and not to participate in those programs." In addition to household dynamics, time was identified as a barrier for women, especially those with young children at home.

Grandmothers also presented a case for their own involvement in community programming. They claimed that the biggest barriers to their participation were cost of program entry and insufficient food, causing them to be weak and therefore unable to participate.

Each group also provided their opinions on proper program delivery. A predominant focus of these conversations was "education" and "training." Popular topics included education on animal management, especially cattle and chickens, nutrition and infant and young child feeding practices, environmental sanitation and hygiene. Each group remarked that education or training would be a critical component to a program's

uptake and success in the community. An important piece to this was often called "follow-up," which requires program leadership to check in with participants, set bench-marks, and stay engaged. Several groups reflected that once a program is over the leadership structure leaves or falls apart and there is no follow-up to see if the community has stuck with the program, rendering it unsustainable. Mothers touted a past program as successful by saying in summary, "They added that it was successful because there was close follow-up and provision of feedback."

This leads into the importance of accountable leadership. Several groups mentioned that some programs were unsuccessful because the leaders had a different agenda than the participants. For example, fathers mentioned that an irrigation project failed in the community because, "…the leaders had other interests other than the project activities, lack of follow up from the project implementers, [and] lack of knowledge/education on the part of the community regarding the programs." Mothers also added that to overcome these obstacles, it would be necessary for, "formation of groups and group leadership [to be] selected by members themselves."

Key informants had a different perspective on programming in the community. There was no unanimous consensus on successful or failed programming, but many of the informants did agree on several aspects. The most successful programs mentioned were the TASAF programs. Based on the information from the informants, TASAF refers to the Tanzania Social Action Fund program, which is a wide-scale approach to tackling poverty from a number of angles. The informants mentioned cash programs in addition to livestock programs including goats, chickens, and cattle. Most agreed that the goat and chicken

programs were successful because the participants received animals, were trained on how to raise them, and saw profit. The cattle project, however, had mixed reviews. The cattle project, also referred to as the "more milk" program (not related to this project) gave community members cattle of a resilient breed. These cattle required specific feed, vaccinations, and completion of insemination procedures. Informants commented that the project failed due to the complicated procedures, which required participants to travel for vaccinations or to buy expensive feed, little follow-up from livestock experts, and unfair participant selection procedures. Many said that a group of men were required to share cattle, which created tension in the group.

All with the exception of one key informant agreed that the irrigation and dam projects were the most unsuccessful. These projects were designed to increase water availability for crop fields, and were expected to bring much prosperity to the community. However, as one summary states:

> "The project had [the] potential to support rice irrigation for approximately 300 acres but it was a total failure, [the] most recorded in the village. The project was not participatory and it did not involve the village leadership and did not utilize local community knowledge… The contractor was advised on the water flow in the right direction as per well-known local knowledge, but he did not follow the advice therefore the water was flowing against gravity, [and] hence could not make it to the intended direction."

This irrigation project then became an unanticipated dam which is now used for fishing, according to the officers.

Common barriers to successful programming cited by key informants included issues with the programs themselves and shortcomings of the community. Issues with the programs focused on lack of expert knowledge and follow-up in programs and inadequate targeting of beneficiaries. Community-based problems reflected were lack of community engagement and lack of trust in the community. First, most informants noted that many programs lacked expert knowledge or simply did not hear from experts enough. One key informant claimed, "Most projects do not have the technical personnel. [They] only have the management team but we, the implementers, they must involve us." Often, once experts left the village at the programs completion, the community was unprepared to take on the tasks themselves. Several informants also pointed out the failure on behalf of program leadership to accurately determine who should participate, resulting in an exclusion of the most vulnerable populations such as the elderly and poor.

Additionally, lack of community engagement was a common assertion of the informants, frequently referring to community members as not caring enough about programs to make them successful. The words "laxity," "lazy," and "laziness" were used frequently to describe lack of community engagement. "Laxity" was used four times across three separate interviews. Similarly, "lazy" was used twice across two interviews, and "laziness" was used five times in one interview. Regardless of diction, seven out of nine informants directly claimed unwillingness, triviality in attitude, and the desire to "just want to be supported in everything" on behalf of the community. Lastly, the officials noted a general sense of mistrust in the community regarding program success, due to the number of programs that are unsustainable, abandoned, or unsuccessful. One informant commented

that there are a lot of projects so community members always feel another will come, leading to lower engagement overall.

The contrasts between men and women, and community members and officials are especially interesting. It is apparent that inclusion and validation of each group is highly valued, however all agree that women should be the primary targets of nutrition and infant and young child feeding programming. Both women and men acknowledge the need for inclusion of men. On the one hand, women are more likely to say that men will be jealous if they are not included. Men, on the other hand, may reflect a lack of trust in their wives but also indicate a desire to help them remember and engage in programs. The true motives are unclear, however it is apparent that buy-in from men is important, whether it will allow women to pursue programming opportunities unhindered or assist in their participation. A similar discordance exists between officials and community members. Both have a low level of trust for the other, with community members saying officials are dishonest with money and program materials, while officials say the community is lazy and does not have the motivation to participate sufficiently. Both views are problematic for programs to properly function.

DISCUSSION

Summary of Determinants of Behavior

Several determinants were quite pervasive throughout the analysis, while others were more isolated. Undoubtedly, access to resources limiting physical opportunity was the most frequently encountered determinant. Access to resources significantly impacted responses for each behavior. This was also true for continued breastfeeding, where the

behavior was seen as a necessary adaptation to an environment with scarce resources. Lack of adequate food and income is also reflected in the diet diversity scores, Household Hunger index scores, and milk consumption scores. Lack of resources even impacted other potentially strong behavioral determinants, such as reflective motivation. Knowing resources such as food and milk are scarce and expensive reduces self-efficacy, even if knowledge and social support are present. In addition, lack of resources resulted in a lack of physical opportunity that ultimately led to the perceived barrier of insufficient milk, creating even more preventative determinants for exclusive breastfeeding. Because insufficient milk was the dominant determinant of physical opportunity and reflective motivation, it was able to greatly hinder most of the behavioral process. Access to resources also put up a physical opportunity blockade to reaching sufficient dietary diversity and number of meals for infants and children. This was seen especially in children. As their number of meals increased to four per day, mothers could not keep up to the physical food demands regardless of their knowledge. Physical opportunity was also necessary for the completion of boiling milk each time given, and proved the inverse for a behavior that supplements scare resources, continued breastfeeding. The promotion of continued breastfeeding by lack of resources provides an excellent example of the difference between the ability to perform one behavior versus the potential costs of not performing another. This means that mothers cannot afford to increase food and milk intake for themselves during pregnancy, but cannot afford *not* to supplement their children's diets with breastmilk up until and even past age two. As a free supplemental source of nutrition, continued breastfeeding is an obvious choice for mothers in this community.

Other concerns such as health status and physical ability to breastfeed created issues for both psychological and physical capabilities. For adequate diet diversity for infants and children, physical capability to chew different types of foods, specifically meat, was a hindering determinant of increased variety.

Strong social norms, expectations, and roles fed into the perpetuation of reflective and automatic motivations for most all of the behaviors. Good grandmothers were expected to provide information and help around the house, while good fathers were expected to provide adequate resources. This was sometimes at odds with reality, especially as lack of resources overrode father's social expectations to provide and information from grandmothers did not always coincide with accurate medical advice. These gaps further prevented women from establishing a clear path through motivation and opportunity to behavior.

Perceived Insufficient Milk

In addition to behavioral determinants, several other interesting themes arose from this research. First, perceived insufficient milk is a major barrier to exclusive breastfeeding. Along with mixed knowledge about the importance of exclusive breastfeeding and infant nutritional requirements, insufficient milk is often cited by the participants of this study as the reason for introduction of other foods. This is hardly new in the literature on breastfeeding and infant and young child nutrition. Studies from all over the world have shown that perceptions of insufficient milk lead to early weaning and introduction to supplementary foods.[60] A systematic review of literature on perceived insufficient milk found 20 publications from the U.S., Australia, New Zealand, Turkey, Mexico, Hong

Kong, etc. found that approximately 35% of all the participants in all the studies weaned early due to perceived insufficient milk.[60] While perceptions of insufficient milk are a global phenomenon, there is evidence to support that perceived insufficient milk is only related to actual insufficient milk in that it deters mothers from attempting to breastfeed, reducing the amount of milk she can produce.[61] In lactation, increased feeding is positively associated with increased milk production.[61] However, perceived insufficient milk, due to ques from the baby, breast pain, or breast shrinkage, can cause mothers to reduce the number of feeding times and therefore begin to produce less milk.[61]

The emphasis on insufficient milk amongst the participants in this study may help to explain the gap between doers of adequate maternal nutrition behaviors during pregnancy and during lactation, the increased food, milk, and diet diversity behaviors in each respectively. Although lack of resources remained the most cited barrier to each of these behaviors amongst both pregnant and lactating women, lactating women were able to achieve these nutrition goals more often. For increased food consumption, pregnant women had zero doers while lactating women had five. Considering that these women were from the same community, it is possible to assume that lack of resources is not the sole reason for this discrepancy. Due to the pervasive belief that insufficient milk, especially if adhering to exclusive breastfeeding standards, would lead to undernutrition and illness of the infants, increased food allocation may be seen as more important for breastfeeding women than pregnant women. In addition, preliminary results from a concurrent study in the districts of Handeni and Tanga suggest that eating down is a common practice amongst some ethnic groups of Tanzania. While these data do not yet show evidence of eating down as a widespread practice in these areas, further research may reveal a connection. Because

both perceived insufficient milk and eating down are known in other contexts to have negative outcomes on infant and maternal health, identification of a connection and development of appropriate intervention is crucial.

Infant and Young Child Feeding

Several important findings regarding infant and young child feeding arose from this study. First, notably children and infants older than six months were consuming low amounts of animal sourced foods, such as eggs, milk, and meat. These preliminary findings suggest different interpretations for avoidance of each of these foods. Eggs are not consumed in any capacity by mothers or infants/children, despite some expressed desire to feed children more eggs and the presence of ducks and chickens on most compounds. This suggests a potential combination of economic incentive to raise ducks and chickens, rather than consume their eggs, and cultural beliefs about egg consumption for pregnant and lactating women and young children. Both of these notions are supported in other research in East Africa, and warrant further study. Meat is also rarely consumed in this community, both by mothers and infants/children. It is hypothesized that this is for a similar economic reason, meaning that livestock such as cattle are more valuable as financial stores rather than sources of food. Milk may also be viewed as an economic commodity rather than a source of food. However, the importance of milk to the health of both pregnant and lactating women and young children were expressed by all focus groups and reflected in doer/non-doer surveys. In addition to lack of access to milk, due to low livestock production and high cost, milk is regarded as having almost as many negative consequences as positive. Most focus groups participants and many survey respondents

noted that milk can cause rashes and diarrhea for both moms and their children. It was even said that a baby could be born with rashes if his mother drinks milk while pregnant. The fear of diarrhea may be related to the known importance of boiling milk, to kill any pathogenic bacteria, yet the inability to reliably perform this behavior, due to lack of resources such as fuel and time, is shown by the doer/non-doer surveys. To avoid these negative consequences of consuming milk, which can potentially outweigh the positive consequences, it is most often not consumed, sold, and/or household income is allocated elsewhere.

Doer/non-doer surveys also revealed a discrepancy in eating habits between infants, 6-12 months, and children, 12-24 months. Mothers were much more likely to successfully meet feeding standards for infants compared to children, especially in number of meals and adequate diet diversity. Regarding adequate number of meals, the WHO recommends the number of meals increase from three per day to four per day after the child's first birthday. (WHO) Difficulty for mothers to adhere to four meals per day for children compared to three meals per day suggests that the fourth meal presents a specific challenge in the household. Participants claimed that they know the number of meals fed per day is supposed to increase as the child ages, however most mothers continue to feed at three meals per day "or they may feed them as many times as they come across food or something to eat." This indicates that lack of access to sufficient food may be the reason mothers do not increase to four meals per day after age one. While lack of resources and amount of food available is one likely explanation, mealtime practices may also play a role. If families usually eat two to three meals per day, as in-progress research in this area is starting to suggest, time allocation and ques to feed four times per day may present a hindrance.[62]

Discrepancies of doers and non-doers of infant and young child feeding can also be seen in adequate diet diversity of both ages. Mothers were much more likely to be able to provide adequate diet diversity to children 12-24 months old compared to infants 6-12 months old. The full explanation for this gap will require further research. However, preliminary findings here suggest that fear of choking and the age of the child may be important in mothers' decision-making about what foods to give. This presents an opportunity for concrete nutrition education and intervention regarding improvement of infant diet diversity to increase capacity for women to provide a variety of foods.

Program Implications

The four important tenants of successful community programming raised in the focus groups included community engagement, addressing barriers, appropriate delivery, and adequate leadership. Community engagement suggested that each demographic be included in future programming, fathers, grandmothers, and women. Women said their biggest barrier to participation was time, while grandmothers said cost. Men also posed a type of barrier to women's participation, as they were often jealous and wanting to be more involved. Men may be especially important to engage as one of the most important characteristics of a "good father" is one that actively participates in the community. Adequate leadership required that the community itself be involved in selecting a programs leadership and that leadership should be held accountable for its actions within the program. There was little community trust in the ability of leadership to be honest with information or funds. Importantly, good leadership should also be sure to follow-up with program participants to maintain positive change. Lastly, appropriate delivery from the

program implementers requested, beyond thorough follow-up, adequate expert knowledge in educations and trainings for the community. Focus group participants were adamant that education and training would be the most sustainable form of program. Key informants also had several suggestions for successful programming. More than anything, they said that community members need to be more engaged for programs to operate smoothly.

One example of a behavioral determinant applied to these program implementation guidelines is the targeting of grandmothers and older women to be their community's infant and young child feeding and maternal nutrition experts. Because the role of caregiver and advisor is so powerful in this context, the presence of inaccurate information from grandmothers made reflective and automatic motivation a determinant of not exclusively breastfeeding. A program designed to educate and train grandmothers in proper infant and young child feeding and maternal nutrition practices would utilize the motivation determinants to help women learn medically sound information in a comfortable and trustworthy format.

Strengths/Limitations

This study relied on several strengths. First, the sampling was exhaustive, meaning that the doer/non-doer cohort included all eligible women in the community. The team was also able to succeed in recruiting our target number of survey respondents and key informant interviews. In addition, the majority of the analysis was conducted by one primary researcher, ensuring that the process was standardized to the fullest extent possible and reducing inter-coder discrepancies. This study also heavily relied on well integrated web of theory, specifically the connections between COM-B,[10] Theoretical Domains

Framework,[11] the Behavior Change Wheel,[10] and barrier analysis.[12] This type of theoretical framework is often missing in nutrition intervention design and implementation, making this study an important addition to theory-based social behavior change communication formative research literature.

However, this study also involved several limitations. We were only able to conduct this study in one town due to budget and time constraints. These constraints limit the generalizability of these findings, especially considering the ethnic, religious, and economic diversity of Tanzania. Because of the small size of Masatu, some of the women surveyed also participated in the pregnant and lactating women focus groups, further limiting generalizability. This also affected the size of our doer/non-doer survey cohort. The recommended number is 45 doers and 45 non-doers. Due to the small population of Masatu, even when interviewing all the eligible women in the town, we only reached around twelve women per respondent category. Additionally, several of the focus group discussions took longer than expected. The grandmother group was sent home after a long session, and was paid an additional incentive to return the next day and continue. Lastly, the detailed summaries were deemed necessary for budget and time purposes, but left out information from the key informant interview and focus groups that may have been captured in verbatim transcription.

Next steps

Next steps for this research include the development of a full social behavior change communication plan with the incorporation of the objectives not addressed in this formative research, including the water, sanitation and hygiene, animal management,

women's empowerment, dietary calendar, and Cost of the Diet data. A smaller-scale SBCC plan will be formulated using the interventions functions produced through triangulation of behavioral determinants and program learnings. The supplementation of this plan with the remaining data from the larger project will create a more holistic picture.

Future research questions may also be worth exploring. For instance, it may be useful to know how the "good father" sentiment is disrupted by lack of resources. What happens when men in a community are consistently unable to fulfill an important and pervasive social expectation? It would also be interesting to explore how this might affect household dynamics and ultimately maternal and child nutrition.

REFERENCES

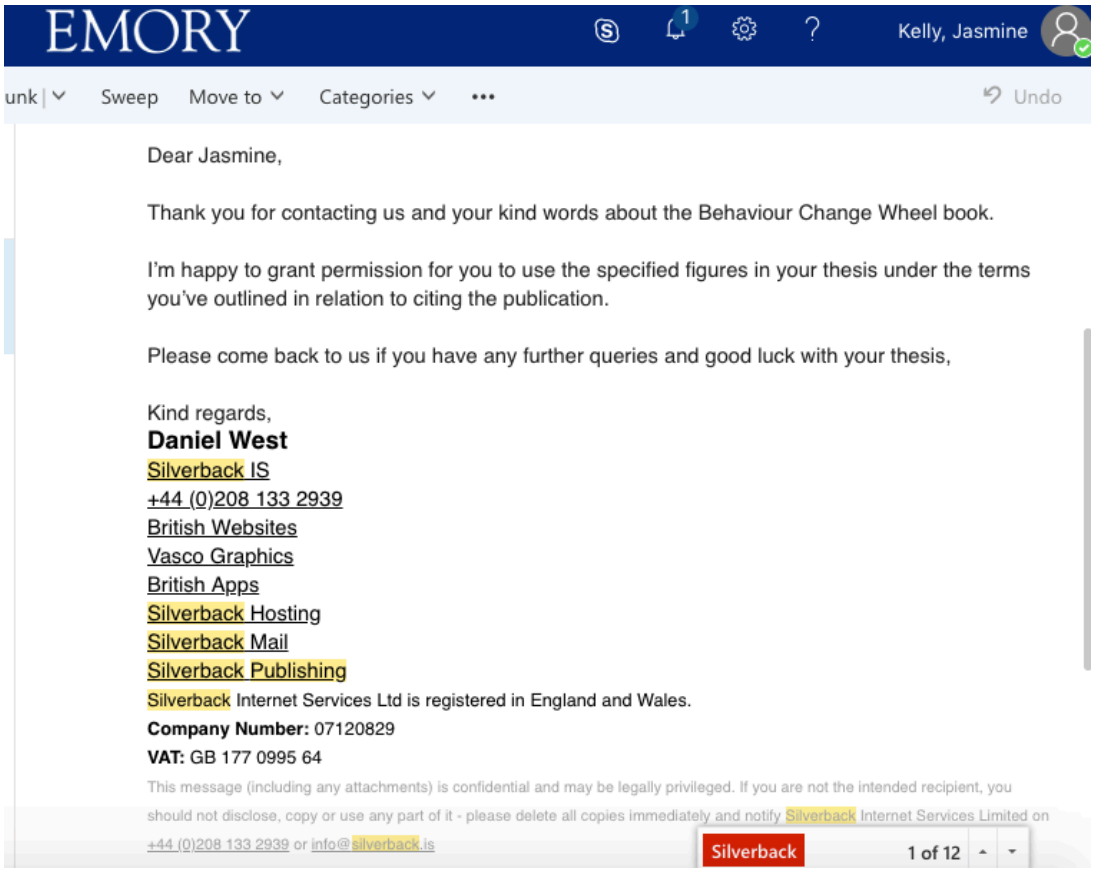
1. FAO, IFAD, UNICEF, WFP, WHO. *The State of Food Security and Nutrition in the World 2017. Building resilience for peace and food security.* Rome: FAO;2017.
2. United Repubic of Tanzania. Mkukuta Annual Implementation Report 2008/09. In: Ministry of Finance and Economic Affairs: Success in the midst of turbulence, ed. Dar es Salaam2009.
3. Keenja C. Food Security in Tanzania; the way forward. *eighth Sokoine Memorial Lecture, SUA Morogoro, Tanzania.* 2001.
4. Matunga BN. *Causes of food insecurity and coping strategies in Tanzania: a case of smallholder farmers In Chamwino district*, Sokoine University of Agriculture; 2008.
5. United Repubic of Tanzania. Basic Data for the Livestock and Fisheries Sectors. In: Ministry of Livestock and Fisheries Development, ed. Dar es Salaam. 2013.
6. United Repubic of Tanzania. Tanzania Census 2002: Analytical Report, Volume II. . In: National Bureau of Statistics, Ministry of Planning, Economy and Empowerment, ed. Dar es Salaam. 2006.
7. Otiso KM. *Culture and customs of Tanzania.* ABC-CLIO; 2013.
8. Njuki, Jemimah, and Pascal C. Sanginga, eds. *Women, livestock ownership and markets: Bridging the gender gap in eastern and southern Africa*. Routledge, 2013.
9. ILRI. More milk by and for the poor: Adapting dairy market hubs for pro-poor smallholder value chains in Tanzania (MoreMilkIT) - Proposal for years 2-5. In: CIGAR Research Programme for Livestock and Fish, ed2013.
10. Michie S, Atkins L, West R. *The Behaviour Change Wheel - A Guide to Designing Interventions.* 5th ed. Great Britain: Silverback Publishing; 2014.
11. Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implementation science.* 2012;7(1):37.
12. The Technical and Operational Performance Support Program. *Designing for Behavior Change: A Practical Field Guide.* Washington, DC: The Technical and Operational Performance Support Program;2017.
13. Saadeh R, Martines J, King F. Complementary feeding: family foods for breastfed children. 2000.
14. World Health Organization. Indicators for assessing infant and young child feeding practices: part 2: measurement. 2010.
15. World Health Organization. Infant and young child feeding: model chapter for textbooks for medical students and allied health professionals. 2009.
16. World Health Organization. Complementary feeding-Report of the global consultation Summary of Guiding principles Geneva, 2001.
17. World Health Organization. Feeding the non-breastfed child 6-24 months of age: Geneva, 8-10 March 2004: meeting report. 2004.
18. World Health Organization. Guiding principles for feeding non-breastfed children 6–24 months of age. 2005. *Google Scholar.* 2009.

19. Marangoni F, Cetin I, Verduci E, et al. Maternal diet and nutrient requirements in pregnancy and breastfeeding. An Italian consensus document. *Nutrients.* 2016;8(10):629.
20. Kramer MS, Kakuma R. The optimal duration of exclusive breastfeeding. *Protecting infants through human milk*: Springer; 2004:63-77.
21. Dewey K. Guiding principles for complementary feeding of the breastfed child. 2002.
22. Kaplinsky RaM, Mike. A handbook for value chain research.2001, Ottawa.
23. Council UNEaS. *Progress towards the Sustainable Development Goals: Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture.* 2017.
24. Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. *The lancet.* 2013;382(9890):427-451.
25. Ruel MT, Alderman H, Maternal, Group CNS. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? *The Lancet.* 2013;382(9891):536-551.
26. Girard AW, Self JL, McAuliffe C, Olude O. The effects of household food production strategies on the health and nutrition outcomes of women and young children: a systematic review. *Paediatric and Perinatal Epidemiology.* 2012;26(s1):205-222.
27. French SD, Green SE, O'Connor DA, et al. Developing theory-informed behaviour change interventions to implement evidence into practice: a systematic approach using the Theoretical Domains Framework. *Implementation Science.* 2012;7(1):38.
28. Rosenstock IM. Historical origins of the health belief model. *Health education monographs.* 1974;2(4):328-335.
29. Bandura A. Social cognitive theory. *Handbook of social psychological theories.* 2011;2012:349-373.
30. Kittle B. A Practical Guide to Conducting a Barrier Analysis2013, New York, NY.
31. Food and Agriculture Organization. *State of Food Insecurity in the World 2015.* FAO; 2015.
32. Covarrubias K, Nsiima L, Zezza A. Livestock and livelihoods in rural Tanzania: A descriptive analysis of the 2009 National Panel Survey. 2012.
33. Pauw K, Thurlow J. Agricultural growth, poverty, and nutrition in Tanzania. *Between the Global and the Local, the Material and the Normative: Power struggles in India's Agrifood System.* 2011;36:795-804.
34. Delgado C, Rosegrant M, Steinfeld H, Ehui S, C C. Livestock to 2020: the next food revolution. IFPRI Food, Agriculture, and the Environment Discussion Paper 28.: Washington, D.C. (USA): IFPRI.; 1999.
35. Sellen DW. Nutritional status of sub-Saharan African pastoralists: A review of the literature. *Nomadic Peoples.* 1996:107-134.
36. European Commission. Country Profile on Nutrition: Tanzania. In: Director General for International Cooperation and Development, ed. Brussels2017.
37. Neumann CG, Bwibo NO, Murphy SP, et al. Animal source foods improve dietary quality, micronutrient status, growth and cognitive function in Kenyan school

children: background, study design and baseline findings. *the Journal of Nutrition.* 2003;133(11):3941S-3949S.
38. Randolph TF, E. Schelling, D. Grace, C. F. Nicholson, J. L. Leroy, D. C. Cole, M. W. Demment, A. Omore, J. Zinsstag, and M. Ruel. Invited Review: Role of livestock in human nutrition and health for poverty reduction in developing countries123. *Journal of Animal Science.* 2007;85:2788-2800.
39. Korpe PS, Petri Jr WA. Environmental enteropathy: critical implications of a poorly understood condition. *Trends in molecular medicine.* 2012;18(6):328-336.
40. George CM, Oldja L, Biswas SK, et al. Fecal markers of environmental enteropathy are associated with animal exposure and caregiver hygiene in Bangladesh. *The American journal of tropical medicine and hygiene.* 2015;93(2):269-275.
41. Ngure FM, Reid BM, Humphrey JH, Mbuya MN, Pelto G, Stoltzfus RJ. Water, sanitation, and hygiene (WASH), environmental enteropathy, nutrition, and early child development: making the links. *Annals of the New York Academy of Sciences.* 2014;1308(1):118-128.
42. Mosites EM, Rabinowitz PM, Thumbi SM, et al. The relationship between livestock ownership and child stunting in three countries in eastern Africa using national survey data. *PLoS One.* 2015;10(9):e0136686.
43. Kaur M, Graham JP, Eisenberg JN. Livestock ownership among rural households and child morbidity and mortality: an analysis of demographic health survey data from 30 sub-Saharan African countries (2005–2015). *The American journal of tropical medicine and hygiene.* 2017;96(3):741-748.
44. Leroy JL, Frongillo EA. Can interventions to promote animal production ameliorate undernutrition? *the Journal of Nutrition.* 2007;137(10):2311-2316.
45. Gittelsohn J, Vastine AE. Sociocultural and household factors impacting on the selection, allocation and consumption of animal source foods: current knowledge and application. *the Journal of Nutrition.* 2003;133(11):4036S-4041S.
46. Howard M, Millard AV. *Hunger and shame: Child malnutrition and poverty on Mount Kilimanjaro.* Routledge; 2012.
47. Wu G, Bazer FW, Cudd TA, Meininger CJ, Spencer TE. Maternal nutrition and fetal development. *The Journal of nutrition.* 2004;134(9):2169-2172.
48. World Health Organization. Promoting optimal fetal development: report of a technical consultation. 2006.
49. Swindale A, Bilinsky P. Household dietary diversity score (HDDS) for measurement of household food access: indicator guide. *Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development.* 2006.
50. Hoddinott J, Yohannes Y. Dietary diversity as a food security indicator. *Food consumption and nutrition division discussion paper.* 2002;136(136):2002.
51. Fan S, Pandya-Lorch R. *Reshaping agriculture for nutrition and health.* Intl Food Policy Res Inst; 2012.
52. Shapiro BI, Haider, J., Alemu, G. W., & Abebe, M. *Crossbred cows and human nutrition and health in the highlands ecoregion: Evidence from Ethiopia.* Addis Ababa, Ethiopia: Mimeo;1998.
53. Omore A, Twine E, Githinji J, Kanyuuru C, Kidoido M. Maziwa Zaidi Theory of Change: Context and start point. 2016.

54. Core Group. *Social and Behavior Change for Family Planning: How to Develop Behavior Change Strategies for Integrating Family Planning into Maternal and Child Health Programs.* Washington D.C.: CORE Group;June, 2012.
55. Glanz K, Rimer BK, Viswanath K. *Health behavior and health education: theory, research, and practice.* John Wiley & Sons; 2008.
56. Ballard T, Coates J, Swindale A, Deitchler M. Household Hunger Scale: Indicator Definition and Measurement Guide. Washington D.C.: Food and Technical Assistance II Project, FHI 360.; 2011.
57. Jones AD, Ngure FM, Pelto G, Young SL. What are we assessing when we measure food security? A compendium and review of current metrics. *Advances in Nutrition.* 2013;4(5):481-505.
58. *MaxQDA* [computer program]. 2018.
59. FAO, FHI 360. *Minimum Dietary Diversity for Women: A Guide for Measurement.* Rome: FAO;2016.
60. Gatti L. Maternal perceptions of insufficient milk supply in breastfeeding. *Journal of Nursing Scholarship.* 2008;40(4):355-363.
61. Galipeau R, Dumas L, Lepage M. Perception of Not Having Enough Milk and Actual Milk Production of First-Time Breastfeeding Mothers: Is There a Difference? *Breastfeeding Medicine.* 2017;12(4):210-217.
62. Girard AW, Little PD, Paula Dominguez-Salas, Kinabo J, Mwanri A, Yount K. Drivers of Food Choice for Pastoralists in Rural Tanzania (ongoing project). In-progress: Emory University, Londond School of Tropical Medicine, Sokoine University of Agriculture; 2018.

APPENDIX I: Letter of permission from Silverback Publishing to use cited figures from The Behavior Change Wheel: A Guide to Designing Interventions.



EMORY

Kelly, Jasmine

unk | Sweep Move to Categories ••• Undo

Dear Jasmine,

Thank you for contacting us and your kind words about the Behaviour Change Wheel book.

I'm happy to grant permission for you to use the specified figures in your thesis under the terms you've outlined in relation to citing the publication.

Please come back to us if you have any further queries and good luck with your thesis,

Kind regards,

Daniel West

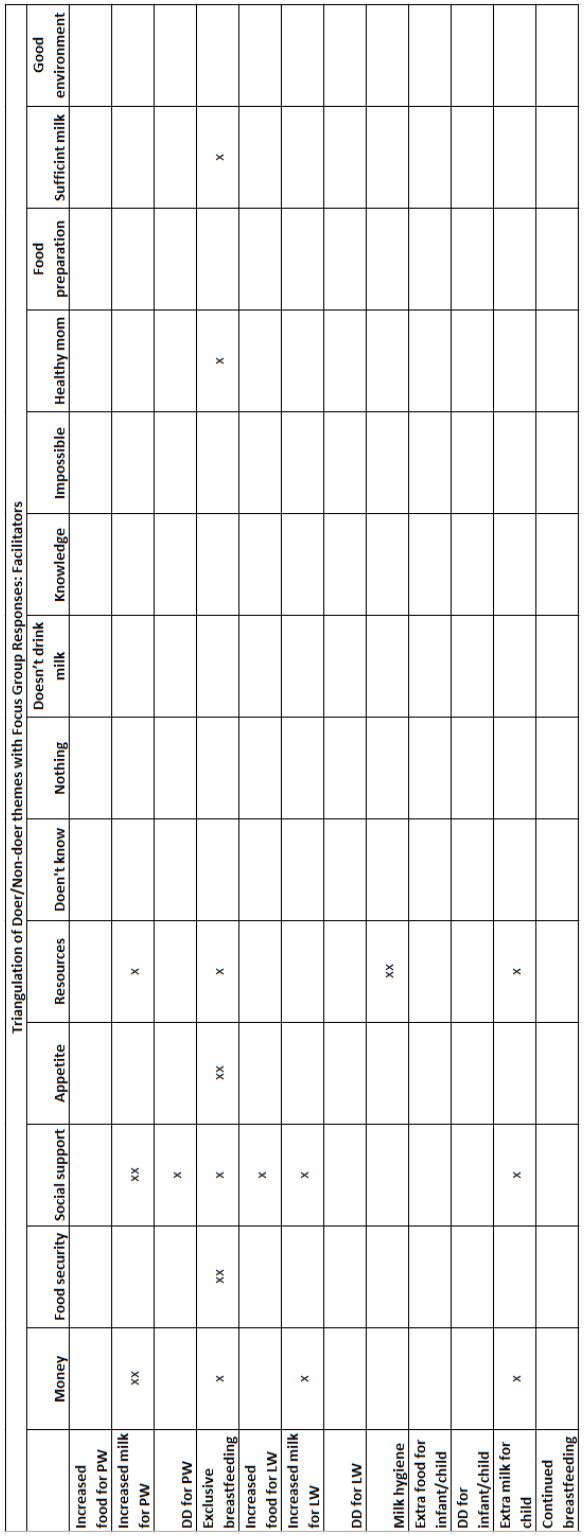
Silverback IS
+44 (0)208 133 2939
British Websites
Vasco Graphics
British Apps
Silverback Hosting
Silverback Mail
Silverback Publishing

Silverback Internet Services Ltd is registered in England and Wales.
Company Number: 07120829
VAT: GB 177 0995 64

This message (including any attachments) is confidential and may be legally privileged. If you are not the intended recipient, you should not disclose, copy or use any part of it - please delete all copies immediately and notify Silverback Internet Services Limited on +44 (0)208 133 2939 or info@silverback.is

Silverback 1 of 12

APPENDIX II: Example triangulation analysis table.



Triangulation of Doer/Non-doer themes with Focus Group Responses: Facilitators														
	Money	Food security	Social support	Appetite	Resources	Doesn't know	Nothing	Doesn't drink milk	Knowledge	Impossible	Healthy mom	Food preparation	Sufficint milk	Good environment
Increased food for PW														
Increased milk for PW	xx		xx		x									
DD for PW			x											
Exclusive breastfeeding	x	xx	x	xx	x						x		x	
Increased food for LW			x											
Increased milk for LW	x		x											
DD for LW														
Milk hygiene					xx									
Extra food for infant/child														
DD for infant/child														
Extra milk for child	x		x		x									
Continued breastfeeding														