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Determinants to Food Hygiene and Preparation in Western Kenya

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Determinants to Food Hygiene and Preparation in Western Kenya

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Bachelor of Science in Community Health and Development

Great Lakes University of Kisumu

2014

Thesis Committee Chair: Matthew Charles Freeman, 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

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In the Hubert Department of Global Health

2021

Abstract

Determinants to Food Hygiene and Preparation in Western Kenya
By Emily Awino Ogutu

Introduction

Diarrhea is a leading cause of child mortality and morbidity worldwide and is linked to stunting of children under two (CU2). Diarrhea causing agents are frequently associated with contaminated food and water sources. Understanding the barriers and facilitators to food hygiene and preparation practices among caregivers is critical to inform interventions to prevent diarrhea and reduce stunting. The aim of this formative research was to explore the determinants to food preparation and hygiene behaviors including handwashing habits, food preparation and cooking practices, and food storage among caregivers in Homa Bay and Migori counties. We used a theory-informed behavior change intervention to address water, sanitation, and hygiene (WASH), and nutrition behaviors.

Methods

We conducted 24 focus group discussions with mothers, fathers and grandmothers; 29 key informant interviews with community stakeholders including implementing partners, religious and community leaders and 24 household observations to understand caregiver practices related to food hygiene and preparation. We used the behavioral domains, capability, opportunity and motivation as our theoretical framework to map caregiver behavioral determinants.

Results

Facilitators to food hygiene and preparation practices among caregivers were capability and motivation. Caregivers had the ability and motivation to wash hands at critical times, wash food, cook food, cover food, and clean and dry utensils. Barriers to food hygiene and preparation practices included lack of psychological capability, for instance, lack of handwashing with soap by caregivers and children, lack of perceived importance of washing some foods before eating and not knowing the perceived risks of storing food for more than four hours. Other barriers were opportunity related to lack of resources (soap, water, firewood) and enabling environment. Time constraints due to work, competing priorities, socio cultural norms and religion hindered the practice of food hygiene and preparation behaviors.

Conclusion

Capability and motivation to practice behavior does not necessarily translate to practicing that behavior without opportunity as these components influence each other. Addressing challenges to food hygiene and preparation would require an integrated intervention design to address these barriers and highlighting the facilitators to enable optimal WASH behaviors in this context.

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Determinants to FOOD HYGIENE AND PREPARATION in western Kenya

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Introduction

Despite the global decline in stunting from 198 million to 144 million over the past twenty years (Unicef/ WHO/The World Bank, 2019), stunting is still a critical public health issue, especially in low and middle-income countries (De Onis, Blössner, & Borghi, 2012). Diarrhea is one of the most important infectious disease determinant of stunting (Black et al., 2013), and a leading cause of child mortality and morbidity worldwide, accounting for 8% of all deaths among children under 5 (UNICEF, 2021). In 2014, Kenya had a 26% rate of stunting in children under 5 (Height-for-age Z scores-2SD) (Kenya National Bureau of Statistics, 2014) and 7% under 5 deaths due to diarrhea in 2017 (UNICEF, 2021).

Stunting can have major implications for long-term health and development, including learning difficulties, language domains, social-emotional functioning, physical well-being and barriers to community participation (Dewey & Begum, 2011; M. et al., 2013). These implications result from interference in growth and development and poor stimulation of changes in the brain due to micronutrients deficiencies like essential amino acids, fatty acids, iron and iodine (Martorell, 2017), leading to the child not reaching their developmental potential (Black et al., 2013). Evidence suggests that stunting is largely irreversible after the first 1000 days, leading to an intergenerational cycle of poor growth and development, in which women who were stunted in childhood remain stunted as adults and tend to have stunted offspring (Georgiadis & Penny, 2017; Black et al., 2013).

Evidence suggests that diarrhea is a significant risk factor for stunting, yet there is limited support to correlating diarrhea alone. Studies have revealed the role of asymptomatic infection can lead to environmental enteropathy, resulting in growth shortfalls (Scharf, DeBoer, & Guerrant, 2014;

Bartelt, Bolick, & Guerrant, 2019). Environmental enteropathy leaves children chronically fighting low-grade infection due to continued exposure to enteric pathogens through poor sanitation conditions. This exhausts children's nutrient supply from their diet thus impeding physical growth and development (Ahmed et al., 2016; Spears, Ghosh, & Cumming, 2013).

Contaminated food provides a pathway for the transmission of enteric pathogens, affecting environmental enteropathy and ultimately stunting (Humphrey, 2009; Motarjemi, Stadler, Studer, & Damiano, 2009). Poor handwashing habits, food handling, preparation and storage can lead to high levels of microbial contamination of food, and interventions focusing on addressing them may reduce contamination (Kinabo et al., 2013; Routray et al., 2015; Saba et al., 2016). Critical actions to prevent foodborne contamination include thorough initial cooking and reheating of food, in terms of both temperature and time; decreasing the time cooked food is stored at ambient temperature; adequate handwashing before and during food preparation and before feeding children; and adequate washing of utensils (Woldt & Moy, 2015).

Contamination of foods with pathogens has been attributed to episodes of diarrhea in low- and high-income countries, with some homes providing many obstacles to safe food hygiene practices (Gautam et al., 2017; Mukuria et al., 2016; Nizame et al., 2016). Evidence shows that transfer of bacteria around the kitchen environment into prepared meals are predicted by a lack of thoroughly washing contaminated hands, utensils including knives and chopping boards both during and after meal preparation (Kennedy et al., 2011). This could be due to the household surfaces being hard to clean as well as water scarcity (Gautam et al., 2017), ambient temperatures for storage (Ehiri et al., 2001), lack of refrigeration, poor food storage facilities and temperature reached when reheating food increasing the frequency of food contamination (Lanata, 2003). Cooking fuel scarcity thus not thoroughly cooking and reheating food, heavy female workloads, poor access to

information on safe hygiene, inadequate sanitation and presence of animals in kitchens leading to environmental fecal contamination (Gautam et al., 2017) may deter hygienic food preparation and safety.

Food hygiene interventions that combine knowledge with behavior change theories and techniques have been effective at changing behaviors related to food hygiene (Biran et al., 2014; Gautam et al., 2017). However, few studies have focused on efforts to improve food hygiene behaviors in household environments in low-income countries (Simiyu et al., 2020). Approaches like Hazard Analysis Critical Control Point (HACCP) that identify points where control measures would be effective to facilitate appropriate targeting of resources (Ehiri et al., 2001; Toure et al., 2013), and the Risk, Attitude, Norms, Ability and Self-Regulation (RANAS) model assessing contextual and psychosocial factors associated with food hygiene practices (Chidziwisano et al., 2020) among others have been used. A recent study in Kenya applied Behavior Centered Design (BCD) theory of behavior change intervention which suggest that behavior change is likely if an intervention can change behavioral setting and cognitive processes associated with that behavior (Simiyu et al., 2020). Although these studies were conducted in peri- urban and rural communities; their focus was limited to specific behaviors.

Understanding the social and behavioral context of the communities is a critical component to designing interventions; and conducting ethnographic research can facilitate this understanding (Tumilowicz et al., 2018). The purpose of this study was to explore the drivers and barriers to food preparation and hygiene practices among caregivers in Homa Bay and Migori counties, using a theory-informed approach. Our data on barriers and drivers of food hygiene behaviors informed the development of targeted improvements to a Care Group model intervention in Western Kenya

(Freeman et al., 2020; Jacob Arriola et al., 2020).

Literature review

Diarrhea and stunting among children under 5

Diarrhea remains the second most common cause of preventable illness and death among children under the age of five worldwide, especially in low and middle-income countries (Davis et al., 2018; Simiyu et al., 2020; Tsai et al., 2019). The 2014 demographic health survey reported a 15% overall prevalence of diarrhea in Kenya, with Migori and Homa Bay counties reporting the highest prevalence of 28% and 24% respectively (Kenya National Bureau of Statistics, 2014). Diarrhea-causing agents are frequently associated with contaminated food and water sources (Kenya National Bureau of Statistics, 2014; UNICEF, 2021). Poor food hygiene practices such as improper handling of kitchen utensils are also among the major causes of diarrhea transmission (Chidziwisano et al., 2019).

Although basic food hygiene practices might reduce exposure to fecal pathogens that result in infections, there have been few rigorous studies to assess this and often ignore the larger context in which childcare occurs (Abuga, Nyamari, & Njagi, 2017; Mumma et al., 2020). A randomized controlled trial to assess the effect of an infant food hygiene intervention on enteric infections in a high burden, low-income urban setting demonstrates evidence that food may be a key pathway for early childhood enteric infection and disease. Basic food hygiene behaviors may be able to mitigate these risks (Nct, 2018).

Food Hygiene and preparation practices

Food hygiene and preparation practices contribute significantly to a reduction in the prevalence of diarrheal diseases (Woldt & Moy, 2015). However, there is limited information regarding the role of food in pathogen transmission in LMICs (Tsai et al., 2019). Proper food preparation and hygiene

practices could contribute to preventing illnesses that are associated with poor child development. Understanding specific food preparation and hygiene practices especially around child food preparation are critical in identifying remedies and best practices that can be adopted and practiced by caregivers based on their cultural and environmental contexts. Some of the hygienic food preparation practices include handwashing with soap, washing and drying of utensils, washing of food, cooking and reheating food, and food storage (Woldt & Moy, 2015). Focusing on these practices could be critical in preventing food contamination. Knowledge of hygienic food preparation practices is important in controlling food contamination. Evidence suggests that lack of knowledge, practices and attitude to food hygiene and preparation are some of the factors which have led to poor food hygiene and preparation practices (Al-Sakkaf, 2015). However, a descriptive cross-sectional survey in 29 institutions with 235 food handlers in Ghana showed that even with the knowledge on the importance of food hygiene, there is laxity in applying strict measures to ensure hygienic handling of food (Akabanda, Hlortsi, & Owusu-Kwarteng, 2017). Some of the factors which contribute to food contamination which are associated with practices around food preparation include the following: 1) covering food to prevent contamination by flies, 2) reheating food, 3) cooking food well, 4) keeping food away from children or animals, 5) using clean utensils, 6) food separation, and most importantly, 6) handwashing before handling food and feeding children are some of the factors which have been thought to contribute to food contamination (Garn et al., 2017; Tsai et al., 2019). Other quantitative and qualitative studies have alluded to those factors. In New Zealand, households having the poorest food hygiene practices reported the highest number of *Campylobacter* infections (Al-Sakkaf, 2015). Studies elsewhere pointed out a lack of correct adherence to food preparation and hygiene practices contributing to food poisoning outbreaks at home (Adebowale & Kassim, 2017; Langiano et al., 2012). Improper handling of

kitchen utensils and poor handwashing practices has been attributed to diarrhea among children (Chidziwisano et al., 2019). In studies conducted in peri-urban settlements of Kisumu, Kenya, caregivers' knowledge on handwashing habits during food preparation and child feeding, food storage options, and reheating of food were expressed as the barriers to hygienic food preparation (Mumma et al., 2020; Simiyu et al., 2020).

Handwashing habits

Food contamination can occur through contaminated fingers, fields, fluids, flies, and feces ((Woldt & Moy, 2015). The most common source of food contamination is through hands when they are not properly washed after contact with feces. Cross-contamination, the transfer of pathogens from a contaminated food via hands (or other vehicles such as utensils) to uncontaminated food, is a further pathway for pathogen transmission (Fosiul et al, 2016). Handwashing with soap is therefore critical in interrupting the transmission routes of disease-causing pathogens thereby preventing diarrhea (Ejemot-Nwadiaro et al., 2015). Having knowledge and necessary resources for handwashing can necessitate practice of behavior. A formative research study in Nepal which focused on handwashing and how it linked to child feeding to inform the integration of hygiene promotion into a complementary feeding program showed that participants had knowledge of the benefits of handwashing before food preparation and feeding but no one used soap for handwashing at critical times (Nizame et al., 2013). Findings from semi-structured interviews and group discussions from a study in Bangladesh indicate that caregivers of young children had relatively high awareness of the need for safer food hygiene, child mouthing, and child feces disposal practices, but were limited by existing household responsibilities and restricted access to enabling technology that would facilitate practicing recommended behaviors (Biswas et al., 2021).

Although knowledge on handwashing with soap at critical times is present among caregivers, less is known about how to help people maintain handwashing in long term (Nwadiaro et al., 2015). Furthermore, a systematic review of 42 studies reporting on the prevalence of handwashing indicates that only 19% of the world population wash hands with soap after contact with excreta (Freeman et al., 2014). However, a study in Kenya found that handwashing with soap was more often practiced after fecal contact (32%) than in connection with food handling, thus being a potential contaminant of food with fecal microbes (15%) (W.-P. et al., 2009). Mouthing behavior, a common practice in children exposes them to fecal-orally transmitted pathogens that can result in diarrhea. A study on oral contact events among infants 3-9 months and caregiver hand hygiene showed that out of 71% feeding junctures observed, both caregiver and infant handwashing with soap was observed in only 1% of the feeding events, and "infant's own hands" was the third most common oral contact at 0.4 oral contact events per hour compared to mean of 2.16 contact events per hour for all events (Davis et al., 2018). This study, however, recommended caregiver hand hygiene prior to feeding events but failed to point out the need for infant hand hygiene. Evidence has suggested that practicing handwashing can be influenced by a number of factors including availability of handwashing stations within reach and convenience (Tsai et al., 2019). Addressing these factors can be critical in improving food hygiene and preparation practices.

Reheating food

Reheating and storing of food are critical components in ensuring food hygiene. Reheating of food at adequate temperature and time as well as storing food at sufficiently low or high temperature to prevent bacterial multiplication are critical household food hygiene actions (Woldt & Moy, 2015). Understanding the beliefs, options, and opportunities within a specific context to facilitate the implementation of interventions to address the existing barriers is critical. A formative research

study in Rural Malawi which assessed the risk factors associated with feeding children under 2 years found that inadequate reheating of food before consumption increased the risk of contamination (Chidziwisano et al., 2019). Consequently, results from a study in urban informal settlements in Kenya whose focus was infant food hygiene and childcare practices reported that only half of caregivers reheated food to make it palatable to the baby, specifically, "to make the food warm for the baby" or "to avoid feeding the baby cold food," and that no caregiver reheated food to boiling point, indicating a lack of knowledge on reheating food (Mumma et al., 2020).

Storing food

Food storage practices influence food hygiene and preparation. The environment around food storage informed by the social and economic realities of caregivers can also influence food hygiene (Mumma et al., 2020). For instance, when food is stored for longer than 4 hours and not reheated to optimum temperature capable of destroying pathogens, it can enhance pathogenic contamination (Ehiri et al., 2001). Additionally, the longer cooked food takes when stored, if not refrigerated and the long lags between food preparation and feeding can facilitate the exponential multiplication of microbes in the food (Gautam et al., 2017; Toure et al., 2013). Some foods like meat, fish and other fleshy foods with lots of moisture if stored in the same container with foods eaten while raw can lead to cross-contamination. A study that examined the frequency of enteric pathogen occurrence and co-occurrence in 127 infant weaning foods in Kisumu, Kenya, using a multi-pathogen PCR diagnostic tool, assessed household food hygiene risk factors for contamination demonstrated that infants in this low-income urban setting are frequently exposed to diarrhoeagenic pathogens in food, and suggests that interventions are needed to prevent foodborne transmission of pathogens to infants (Tsai et al., 2019).

Cleaning utensils and food preparation surfaces

Food hygiene and preparation practices like hygienic cleaning of utensils, properly drying and storage can minimize exposure of utensils to disease-causing pathogens. The use of dirty utensils and unhygienic methods for washing utensils have been associated with diarrhea among children (van Steenbergen WM, 1983; Chidziwisano et al., 2020). Moreover, evidence demonstrates the association between use of dirty utensils and contamination of food even when the food is properly cooked (Ehiri et al., 2001). A potential route of contamination of food could be as a result of not drying utensils well, thus attracting flies carrying microbial pathogens which could be a source of contaminants (Chidziwisano et al., 2019). Chidziwisano and others suggest that determining psychosocial factors that determine behavior is necessary to facilitate behavior change.

Application of theories of behavior change in food hygiene and preparation research

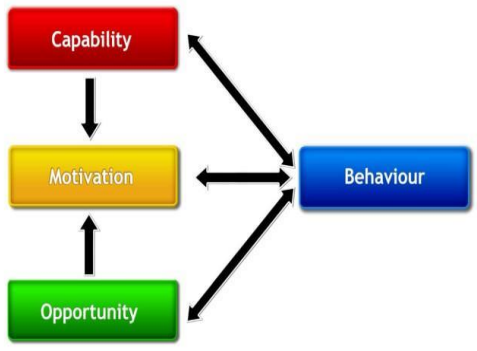
Formative research studies have been conducted to understand food hygiene and preparation practices among caregivers from different regions. These studies have employed different theories and models to help in deconstructing the barriers and drivers to food hygiene and preparation. Studies in Nigeria and Mali adopted Hazard Analysis Critical Control Point (HACCP) approach to identify points where control measures would be effective to facilitate appropriate targeting of resources that could contribute to preventing food contamination (Ehiri et al., 2001; Toure et al., 2013). In Malawi, Risk, Attitude, Norms, Ability, and Self-regulation (RANAS) model was used to assess psychological and contextual factors for behavior change among 323 households with caregivers of children 6-24 months. This study reported that perceived social norms and ability estimates were favorable for washing utensils with soap, keeping utensils on a raised place, and handwashing with soap; whereas perceived vulnerability determined effective handwashing and storage of utensils (Chidziwisano et al., 2019). However, the study only focused on two specific behaviors; cleaning and drying of utensils and handwashing with soap at critical times prompting

the need to assess the other related behaviors. Recently, a study in Kenya applied the Behavior Centered Design (BCD) theory of behavior change intervention and suggested that behavior change is likely if an intervention can change behavioral setting and cognitive process associated with that behavior (Simiyu et al., 2020). Subsequently, randomized control trial elsewhere which used the behavior-centered approach concluded that food hygiene interventions can significantly reduce diarrheal disease prevalence in children under five years in a low-income setting and recommended embedding the promotion of food hygiene practices using a behavior-centered approach in nutrition and WASH policies and programming (Morse et al., 2020). Additionally, using the health belief model and focusing on the perceived risks, perceived benefits, and self-efficacy, Chidziwisano et al. recommended continued practice of already existing beneficial behavior. For instance, increasing the risk perceptions on storage of utensils and handwashing practices with motivational exercises and also acknowledging that caregivers had existing technical know-how of local dish rack and tippy tap construction (Chidziwisano et al., 2020; Chidziwisano et al., 2019). Although these studies were conducted in peri-urban and rural communities; their focus was limited to specific predetermined behaviors. Additionally, the theories and the models used have not been successful in identifying all the variables that influence behaviors (Robert et al., 2011).

The COM-B Model is a great tool for identifying and understanding determinants of behaviors, what needs to be altered to facilitate behavior change (Social Change UK). In order to deliver effective behavior change, interventions must target one or more components of the COM-B model. These components of behavioral determinants include capability, opportunity, and motivation (Michie, van Stralen, & West, 2011). *Capability* is defined by Michie as having the necessary skills or knowledge to perform an activity. *Capability* is further broken down into

physical capability, involving physical skills, strength or stamina; and *psychological capability*, having knowledge and psychological skills. *Opportunity* are the factors that lie outside the individual that influence one's ability to perform a behavior. This is further defined as *physical opportunity* including resources, triggers, environment, locations, and time; and *social opportunity* including interpersonal influences, social structures, and cultural norms. Motivation are all those brain processes - habitual or emotional - that energize and direct behavior, not just goals and conscious decision-making. Motivation is further defined as *reflective motivation*, which involves self-conscious planning, reflection, intentions, and evaluations; whereas *automatic motivation* involves processes involving wants and needs, desires, impulses, and reflex responses (Michie et al., 2011). These three components influence each other and a change in one component informs change in the other. For instance, changing perceived capability and opportunity can influence a person's motivation to practice a particular behavior. Having motivation to practice behavior, therefore, does not necessarily result in practicing behavior unless capability and opportunity is addressed.

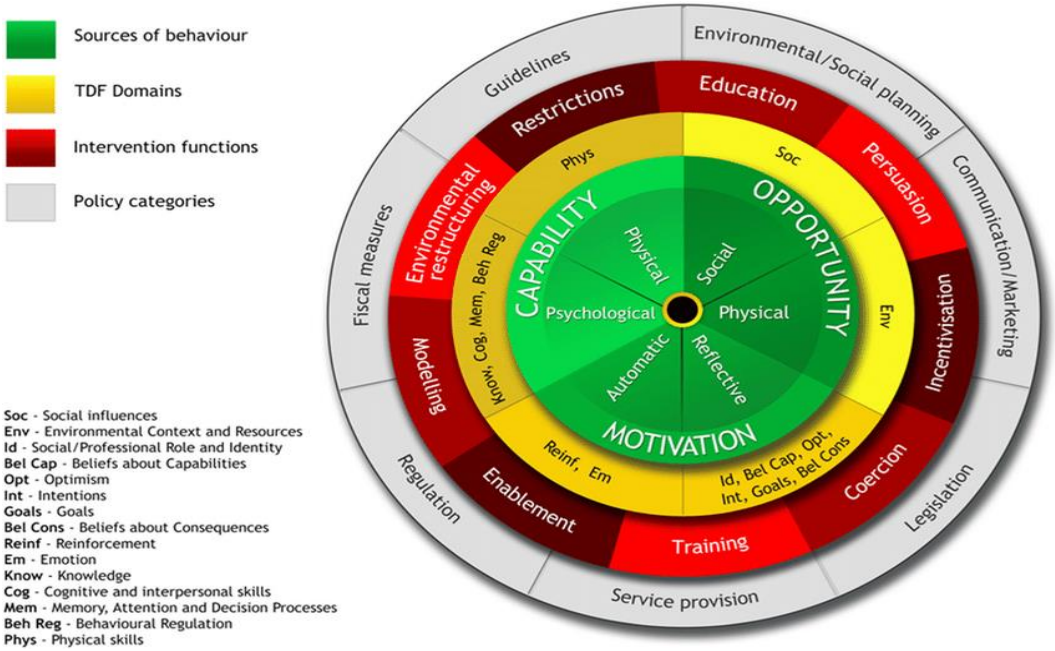
The COM-B system - a framework for understanding behavior (Atkins & Michie, 2015)



The COM-B Model can be used with the Theoretical Domains Framework (TDF). The TDF was developed by synthesizing 128 constructs from 33 theories of behavior into a framework for implementation science. It further categorized behavioral constructs into 14 domains that can be

used to identify barriers and drivers to targeted health behavior. These domains include: 1) knowledge, 2) skills, 3) memory, 4) attention and decision process, 5) behavioral regulation, 6) social professional role and identity, 7) beliefs about capabilities, optimisms, 8) beliefs about consequences, 9) intentions, 10) goals, 11) reinforcement, 12) emotions, 13) environmental context and 14) resources and social influences (Atkins & Michie, 2015). Through mapping of identified barriers and drivers of behavior by TDF, and using COM-B Model to identify which barriers and drivers are the largest influences on behavior, behavior change interventions can be created using intervention design methods like Behavior Change Wheel to target specific determinants of behavior, or mechanisms for actions (Atkins & Michie, 2015; Michie et al., 2011).

The Behavior Change Wheel. (Atkins & Michie, 2015)



Although evidence link food hygiene and preparation practices to reduction in prevalence of diarrhea (Woldt & Moy, 2015), there exists limited information on the role of food in pathogen transmission in LMICs (Tsai et al., 2019). Food preparation and hygiene practices could be associated with this. Some of these few existing studies have recommended the use of existing

technologies and interventions, the need for interventions to prevent transmission of pathogens (Chidziwisano et al., 2019; Chidziwisano et al., 2020; Robert et al., 2011), and embedding promotion of food hygiene practices into WASH policies (Morse et al., 2020). However, understanding the contextual and social factors that may facilitate and hinder the practice of certain behaviors and use of interventions is important in informing interventions and innovations.

THRIVE II project

The THRIVE II project was a two-year project which began in January 2016, and was implemented by Catholic Relief Services (CRS) and other six partners including Emory University. The goal of THRIVE II project was to create a culture of care and support for HIV and AIDS affected children under two years and their caregivers in Kenya, Tanzania, and Malawi. Funded by Conrad N. Hilton the project developed a sustainable model for ongoing support to households so that caregivers of children under two practiced early childhood stimulation; positive parenting; infant and young child feeding and water, sanitation and hygiene behaviors while incorporating into health facilities early stimulation, positive parenting counseling, and maternal mental wellbeing in Kenya, Tanzania and Malawi. The project targeted an estimated population of 8,800 pregnant mothers and caregivers of children below 2 years in Kenya (2,640); Tanzania (2,640) and Malawi (3520).

As part of THRIVE II, Catholic Relief Services and Emory University partnered to develop and test an Infant and Young Child Feeding (IYCF) and WASH integrated behavior-based intervention targeting stunting in the first 1000 days of life in Western Kenya. The primary purpose of this study was to develop and refine an intervention to integrate messages on IYCF, WASH, and deworming behaviors and document behavior change. The TDF and COM-B Model frameworks were used to identify barriers and facilitators to several maternal and child nutrition

behaviors, including food hygiene and preparation practices.

Methods

Catholic Relief Services (CRS) partnered with Emory University and Uzima University (Kenya) to create an integrated baby water, sanitation and hygiene (WASH) and nutrition behavior change intervention to decease the prevalence of stunting (Ellis et al., 2020; Jacob Arriola et al., 2020; Freeman et al., 2020). We conducted formative research to explore the barriers and facilitators to practicing optimal food hygiene and safe food preparation practices by caregivers living in Migori and Homa Bay counties, western Kenya (Freeman et al., 2020).

Study sites

This research took place in eligible CRS communities that were receiving THRIVE II, an intervention targeting behaviors of caregivers of HIV/AIDS-affected children under two (CU2). The THRIVE II intervention used the care group model (Perry et al., 2014) to adopt WASH and nutrition behaviors, and to encourage early stimulation and positive parenting. We purposively sampled participants from areas surrounding six health facilities in Western Kenya (N=3, Migori County; N=3, Homa Bay County). Homa Bay and Migori counties have the highest HIV prevalence in Kenya; at 20.7% and 13.3% compared to the national prevalence of 4.9% (National AIDS Control Council, 2018). Participants were recruited from communities which had a minimum of six women that lived near the health facilities and were either pregnant or had CU2. Preference was accorded for communities with variability in agro-ecological zone, distance to the nearest health facility, and distance to the nearest urban center (Ellis et al., 2020).

Training of Research Assistants

Seven research assistants from Kenya were trained over two weeks. Research assistants provided input on adaptations to translation, cultural appropriateness, and length of tools. Research tools were piloted with THRIVE II participants and community health workers in Migori County, and tools were adjusted to improve clarity and focus on thematic question domains.

Data collection

Qualitative data were collected from October to December 2016 in Kenya (Migori and Homa Bay counties). Methods included conducting FGDs, KIIs, structured household observations, and household spot checks. We recruited caregivers of varying ages and genders, as well as key informants who worked on THRIVE II programming.

Focus group discussions

We conducted FGDs with pregnant women, mothers and grandmothers of CU2 to understand their practices related to food hygiene and preparation. Focus group discussions were facilitated by female community health workers. FGDs were held in the communities in churches or local health facilities. All participants had to be 18 years or above, and mothers who self-identified themselves as pregnant or had a child/grandchild between the ages of 1-23 months. Six to eight participants were recruited for each focus group. Pregnant women and mothers were selected based on their participation in THRIVE II; grandmothers were related to the THRIVE II participants (Ellis et al., 2020).

Key Informant Interviews

KIIs were conducted with religious and community leaders, community health extension workers, community health workers, implementing partners, and THRIVE II staff to gain their understanding of factors that influence the uptake of practices surrounding food hygiene and preparation, infant and young child feeding as well as intervention implementation. The key informants included religious and community leaders who were identified by the CRS staff and their selection was based on their knowledge and experience working within the communities where the study took place. The community health extension workers who were interviewed had to be based in the community and attached to the health facilities within the catchment area. We also interviewed CRS staff and implementing partner staff to further understand the goals of THRIVE II and how each person saw project goals being achieved. Implementing partner staff were from Homa Hills Development Organization and Mercy Orphans Support Group; local organizations engaged by the CRS in the implementation of the project.

Observations

Observation was conducted in 12 households with the primary focus being the index child. Observations were conducted over two days, spending 4 hours in the household on day one and 6 hours in the same household on day two to understand shift in behaviors over two days. The household under observation had to have a child aged between 6-24 months. Two different households were observed by a different researcher per day, one with an index child aged between 6-12 months, and one with an index child aged between 13-24 months. Research assistants used a structured observation tool to record all the observed behaviors related to food hygiene. Observations typically took place in the middle of the day, as this was when caregivers gave permission for researchers to enter their homes. Caregivers usually prepared a mid-day meal, enabling the research assistants a chance to observe their food preparation and hygiene practices.

Household spot checks were conducted in the same households participating in observation activities. Household spot checks were used to assess the compound environmental sanitation and sanitation hardware.

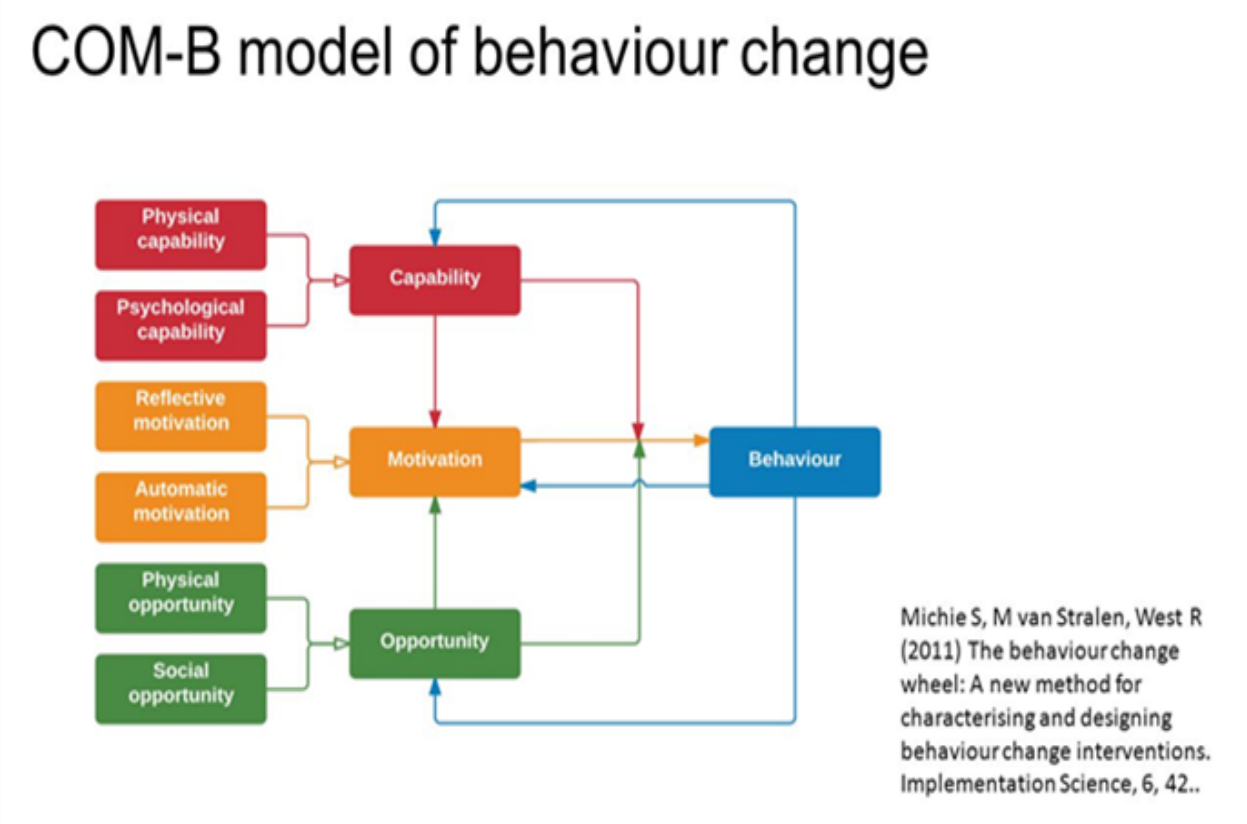
Data Management and Analysis

FGDs and KIIs were conducted in Luo and audio-recorded after acquiring consent from the participants. The data were uploaded, transcribed, and translated into English. The uploaded audios and transcripts were stored on a HIPAA-protected webserver. The audio files were immediately deleted from the recorders once uploaded. Consent was also acquired from the caregivers before household observations. Detailed notes from household observations were written in English. All data were password protected to ensure privacy. Prior to analysis, all transcripts and data were de-identified.

Data analysis started during the data collection process. The research team debriefed daily, discussing the emerging themes surrounding food preparation and hygiene practices. We used thematic analysis (Caruso et al., 2017; Guest, 2012) to identify common barriers and facilitators to the targeted behaviors, including food preparation and hygiene, and developed these into a codebook.

Through use of the COM-B model of behavior change and behavior change wheel framework, (Figure 1), the domains that need to be present for behaviors to occur – capability, opportunity, and motivation (Michie, van Stralen, & West, 2011) were used as codes in addition to specific behaviors of interest.

Figure 1 COM_B model of behavior change (Michie et al., 2011)



Capability was defined as having the necessary skills or knowledge to perform an activity. *Capability* was further broken down into *physical capability*, involving physical skills, strength or stamina; and *psychological capability*, having knowledge and psychological skills. *Opportunity* were the factors that lie outside the individual that influences one's ability to perform a behavior. This is further defined as *physical opportunity* including resources, triggers, environment, locations, and time; and *social opportunity* including interpersonal influences, social structures and cultural norms. Both *capability* and *opportunity* need to be addressed before moving on to *motivation*. Motivation were all those brain processes- habitual or emotional-that energize and direct behavior, not just goals and conscious decision- making. Motivation was further defined as *reflective motivation*, which involves self-conscious planning, reflection, intentions and evaluations; whereas *automatic motivation* involves processes involving wants and needs, desires,

impulses and reflex responses (Michie et al., 2011). Transcripts were then coded using MAXQDA v20.1.1. Observation data were analyzed using Microsoft Excel and organized by the codebook.

Ethical approval

The research protocol was reviewed and approved by the Great Lakes University of Kenya Research Ethic Committee (Kisumu, Kenya) (#CREC/1954/2017), the Government of Kenya National Commission for Science, Technology and Innovation (Nairobi, Kenya) (NACOSTI/P/16/72200/13631), and Emory University's Institutional review Board (Atlanta, GA) (#IRB00090057). All participants provided written informed consent.

Results

We conducted 24 FGDs with mothers (N=12), fathers (N=6) and grandmothers (N=6); 29 KIIs with community stakeholders; and 24 household observations in 12 households involved in this study. Table 1 presents demographic data from FGD participants.

Table 1 Demographic data of FGD participants

Characteristic	Mothers	Fathers	Grandmothers
	Overall (n=68)	Overall (n=36)	Overall (n=36)
Age (range)	28 (18-45)	37.5 (25-68)	55.6 (25-87)
Number of children	4	4.5	7
Age of first child	11	14	34
Age at birth of first child	18	24	17.5
Number of people in household	6	7.5	5.5

Number of people in compound	8.5	8	10
Education, n (%)			
Completed Primary school	48 (71%)	17 (47%)	32 (92%)
Completed Secondary school	16 (22%)	14 (39%)	2 (6%)
Completed Tertiary school	4 (7%)	5 (14%)	1 (3%)
Occupation, n (%)			
Business	28 (41%)	7 (19%)	7 (20%)
Housewife	21 (31%)	-	5 (14%)
Fishing	-	5 (14%)	
Farmer	8 (12%)	13 (36%)	21 (60%)
Other	6 (8%)	9 (25%)	2 (6%)
Unemployed	5 (8%)	-	-
Sanitation access, n (%)			
Can access a latrine	43 (63%)	24 (67%)	25 (71%)
Cannot access a latrine	25 (37%)	12 (34%)	10 (29%)
Shares a latrine, n (%)			
Yes	22 (32%)	17 (47%)	18 (51%)
No	22 (32%)	8 (22%)	8 (23%)
N/A	24 (35%)	11 (32%)	9 (26%)
Latrine Ownership, n (%)			
Yes	28 (41%)	23 (64%)	25 (71%)
No	16 (24%)	2 (6%)	8 (23%)
N/A	24 (35%)	11 (31%)	2 (6%)
Primary Water Source, n (%)			
River/lake/ pond/stream	31 (46%)	15 (42%)	18 (51%)
Piped water	18 (27%)	7 (19%)	7 (20%)
Water pan	6 (9%)	4 (11%)	4 (11%)
Deep bore hole	9 (13%)	4 (11%)	1 (3%)

Open well	-	4 (11%)	-
Other	4 (5%)	1 (3%)	5 (15%)
Distance to Water Source, n (%)			
Outside of compound	65 (96%)	35 (97%)	33 (94%)
In own compound	3 (4%)	1 (3%)	2 (6%)

We present results related to the following behaviors determined by the data: 1) handwashing with soap before food preparation, before caregivers' eating, and before caregivers fed CU2; 2) washing of food before preparation, 3) cooking food, 4) reheating of food, 5) washing and storage of utensils after food preparation, and 6) storage of food after preparation (Table 2). These results are aligned to Michie's behavioral domains, *capability, opportunity and motivation,* which could assist in guiding the development of future interventions (Michie et al., 2011).

Table 2 Results summary based on COM-B domains

COM-B domain determinant definition	**Handwashing with soap at key events**	**Washing and separating food**	**Cooking and reheating food**	**Cleaning utensils and food preparation surfaces**	**Covering and storing food**
Physical capability (physical skills, stamina and strength	(+) Caregivers physical ability to wash and air-dry hands (+) Caregivers physical ability to	(+) Caregivers physical ability to wash food	(+) Caregivers physical ability to cook food	(+) Caregivers physical ability to wash utensils	(+) Caregivers physical ability to cover and store food

	wash their children hands (+) Caregivers physical ability to fetch water				
Psychological capability (knowledge, skills, and behavioral regulation)	(+/-) Caregivers knew how to wash their hands and children's hands (+) Caregivers mentioned the critical times for handwashing	(+) Caregivers washed kales before slicing (-) Caregivers did not wash fruits requiring peeling	(+) Caregivers cooked food thoroughly (+) Some caregivers cooked some foods in small portions to avoid spoiling (-) Some caregivers cooked food in large quantities and did not reheat before eating	(+) Caregivers used 3 rinse system (+) Caregivers dried utensils before use (-) Caregivers wiped wet utensils with towel	(+) Caregivers covered food (-) Caregivers stored food for more than 4 hours or even overnight

Physical opportunity (environmental context and resources, including time, affordability of resources, access, and enabling environment)	(+) Caregivers used ash/salt when soap was not available (+) Soap was available nearby (-) Caregivers lacked soap because of affordability (-) Caregivers lacked water (-)- Water source was far away (-) Caregivers lacked handwashing station in food preparation area	(+) Caregivers had water available in the house for washing vegetables (+) Basin for washing vegetables was available (-) Caregivers lacked enabling environment to wash food while traveling or in the market	(+) Caregivers had food available (+/-) Firewood availability (+/-) Water availability (-) Time constraint due to work demands	(+) Caregivers used racks and other alternatives like crates, fence, basins to dry utensils (+/-) Soap availability for cleaning utensils (+/-) Water availability (-) Racks destroyed by animals (-) Racks not high enough to control access by animals	(+) Caregivers had different items for covering food like plates, cooking pot, metallic covers (+) Caregivers used varied ways of storing food like hanging on the rope, keeping in cupboards, storing in thermos
Social opportunity (social and cultural norms, and interpersonal influence)	(-) Women lacked decision-making power on spending thus not able to prioritize soap for handwashing		(+/-) Sharing roles of cooking (-) Social norms of foods not being reheated due to cultural practice (-) Social norm of religion not permitting lighting	(+) Social norm of sharing household responsibilities among women and teenagers (-) Competing priorities	(-) Belief that some foods if covered would go bad thus not covering food

			fire on Saturday and Sunday (-) Social norm of men purchasing food so caregivers lacked control of separating food		
Automatic motivation (wants, needs, automatic responses, and impulses)	(+) Presence of visible dirt facilitated handwashing for children			(+) Disgust related to flies from latrine landing on dirty utensils if left unwashed	
Reflective motivation (self-conscious planning and evaluation, and beliefs about what is good or bad)	(+) Dirty hands could harbor microbes which can make one sick (-) Caregivers prioritizing water for other things but not for washing hands	(+) Caregivers prioritized water for washing food	(-) Caregivers prioritized continuing to work to coming back home and reheating food	(+) Caregivers had a specific routine designated to cleaning utensils (-) Caregivers prioritized other work to cleaning utensils	(-) Caregivers belief that moisture from hot food will spoil food

*Key: (+) – facilitator; (+/-) – facilitator and barrier; (-) – barrier

Capability

Capability is defined as having the necessary skills or knowledge to perform an activity. This is further broken down into *physical capability*, involving physical skills, strength or stamina; and *psychological capability*, having knowledge and psychological skills (Michie et al., 2011).

Physical and psychological capability were determinants to food preparation and hygiene in different ways as outlined.

Physical capability

Caregivers showed physical ability in washing hands, washing utensils, washing food, cooking, covering and storing food and fetching water and firewood. All informants washed food before preparation or eating. Typical examples of foods that were washed included vegetables, sardines, rice and fruits. Greater importance was placed on washing food that could not be peeled. Many fruits, including mangoes, bananas and oranges were not deemed important enough to be washed because they could be peeled.

During observations, participants always washed "omena" (sardines) before it was prepared. Tomatoes were washed approximately half of the time. Rice was carefully washed and sorted twice before cooking. Participants were observed to carefully wash kale at home, instead of buying it precut from the market.

> *"I often buy kale before they are cut because when I go and wash, the sand does not come out so I buy kale which have not been cut and wash slowly, one by one, and then I slice…"*
> *Mother, Homa Hills*

Caregivers cooked their food thoroughly and could describe how they would know that the food was well cooked. For example, caregivers indicated that porridge is cooked until it boils, removed from the fire, and then returned to heat and left to boil. A typical meal prepared for both lunches and dinners was "ugali" (bread made from corn, cassava or millet flour), kale and "omena" (sardines). Mothers mentioned that they would prepare dinner early so that children would eat before sleeping, giving priority to children over adults.

"You wash the cooking pot well and put it on fire. I pour water and then after pouring water, after it has boiled, I stir enough flour in a cup. After stirring and the water has boiled then I add to it, after I have stirred and it has become thick and I have added water, when it bubbles if I add sugar if I have but when I don't have sugar but I have lemon I can add the lemon. When it is cooked, I remove it." Mother, Homalime

Grandmothers shared their past practices when preparing food for children under 6 months. They mentioned that they would give infants a mixture of water and boiled milk, water, water and boiled herbs and water. This would be cooled to room temperature before feeding it to the child. Boiled water and herbs were given to the infants to prevent them from getting stomach ache. Caregivers mentioned that they would warm leftover food before feeding it to the family. The index child's porridge would be stored in a thermos to keep it warm and caregivers pour a small portion in a cup so that the rest does not spoil.

Caregivers reported washing utensils used for food preparation and feeding on daily basis. Many described a similar step-by-step process which included 3 rinses, use of soap and abrasive tool, and drying in the sun before storing in the house. This task was usually the responsibility of the mother or another female family member, and necessitated water and time. As part of THRIVE II and the Ministry of Health initiative through the community health strategy, the emphasis for food hygiene practices has been placed on washing and drying utensils using a drying rack that is placed in the sun. However, from observations, only 4 out of 12 households utilized a drying rack.

"When I wake up in the morning, I take utensils outside, I put water in three basins, one for cleaning and the other two are for rinsing, then I place – those that I have rinsed I allow to dry up, then I take them into the house, and cover them when they have dried, that's how I clean my utensils." Mother, Sori

Psychological capability

Psychological capability was demonstrated when caregivers shared that they learnt about handwashing from their school-going children, who were taught in school on how to wash their hands and in-turn taught their parents back at home. Caregivers mentioned different handwashing events for themselves and their children (Table 4). Grandmothers shared how they washed their hands "clean" using soap and air drying before serving food. Mothers insisted that they were the ones to hand-feed their children since they knew best how to wash their hands clean.

> *"Here, I am the one who gives the child's food when I want to feed her, it is me who have to feed her because I am the one who knows how I hand-wash. Now after washing my hands with soap and have dried is when I take food to feed my child." Mother, Sori*

Table 3 Observed Mother Handwashing Practices and Opportunities

Key event	Total opportunities	Washed with water	Washed with soap	Not washed
Before eating	14	8	0	6
Before feeding the infant/child	20	7	0	13
Before food preparation	16	3	1	13
After feeding the child	20	2	0	18
After eating	14	4	0	10
After cleaning baby post defecation	7	2	2	5
After adult toilet	7	3	0	4
Other	5	1	0	4
Total	103	30	3	73

Handwashing events for children (Table 4) was done by mothers and grandmothers but fathers would step in in their absence. Mothers and grandmothers agreed that most children would not start washing their own hands until they were 4-6 years old, however, caregivers mentioned that the children "touch dirty things," especially those who were crawling and so their hands needed to be washed more frequently.

> *"That a small child, anytime they come from play and they want to eat, you have to wash their hands because where they walk, he/she doesn't know even how to differentiate chicken feces, he/she will carry with her/his hands. So anytime you want to give something then you have to wash the hands clean with soap." Grandmother, Homa Hills*

Table 4 Observed child handwashing by caretaker practice and opportunity

Key Event	*Total Opportunities*	*Washed with water*	*Washed with soap*	*Not washed*
Before eating	20	9	0	11
After eating	20	5	0	15
After defecating	7	1	0	6
Other	23	0	0	23
Total	70	15	0	55

Lack of psychological capability was noted with failure of grandmothers and mothers to follow all the handwashing steps. Grandmothers noted that they poured water into a basin, washed hands by dipping, poured out the water used to wash hands and rinsed hands with clean water. Caregivers

further explained that they would just soak the child's hand in water and remove, failing to handwash well thus exposing themselves to ingesting microbes.

> *A child who is less than two years, I don't wash her hands the way I wash mine. I just soak it and then I remove it…because it doesn't have germs. Mother, Sori*

Grandmothers mentioned that sometimes when they were harvesting sweet potatoes or cassavas, they could not wait to go and clean them at home but would instead wipe out the soil, peel them using their mouth and eat then uncleaned. Caregivers lacked knowledge on the risks of food contamination when cooked in large quantities and storing for long periods. Some of the caregivers stored food for more than four hours before reheating and/or eating again, usually during the day when the caregivers were away for work. Left-over food was also stored to be eaten the next day.

Cleaning infant cup covers with a nipple was challenge, although in observations, cups with a bottle top and nipple were used to deliver porridge to younger children, who may not have been able to feed themselves. Many caregivers also believed that baby bottle could be dirty and spread disease, relating this to the difficulty in properly cleaning the nipple part. One grandmother described the difficulty of keeping a baby bottle clean.

> *"…feeding the child milk or porridge using the baby bottle will expose it [the child] to infections...[t]here are times when it is washed outside and not washed in the inside and there might be some dirt remaining inside there. When the baby just feeds on it, he/she starts having diarrhea." Grandmother, Homa Hills*

Opportunity

Opportunity, both physical including resources, environment, locations, and time; and social opportunity including interpersonal influences, social structures and cultural norms (Michie et al.,

2011) played a major role in caregivers practicing behaviors related to hygienic food preparation and safety.

Physical opportunity

Basin, water and soap were the most frequently mentioned handwashing materials in possession of caregivers. Grandmothers and mothers used plastic basins and collected water in a plastic jug or container, or a kettle and used that to pour water during handwashing. Caregivers mentioned having a jerrycan with a hole hung near the latrine and filled with water for handwashing after latrine use; however, there was no mention of a designated place for handwashing near the cooking area. Grandmothers talked about wiping hands with a clean towel after washing. Bar soap and laundry soap was generally available in small shops and markets, however, handwashing with soap was a challenge to caregivers. While few caregivers reported soap as being cheap, others reported the cost of soap as a barrier of handwashing in general.

In our study communities, more than half of the caregivers collected water from sources outside their compounds. In communities close to Lake Victoria, water was more readily accessible than in communities in hilly areas, where women reported taking as much as two hours per day while fetching water.

> *"So the lake is far, and us people from- these two people besides one another, we are far from the lake, we are at the furthest end, but we collect water from the lake."*
>
> *Grandmother, Homa Hills*

The most common food preparation space was the kitchen and was swept every morning in most homes. Kitchens were used for varied purposes including food preparation and cooking, utensil cleaning and storage space, and as a sleeping area for children and animals including chicken.

Other food preparation surfaces were rarely mentioned. Sweeping the kitchen floor was a norm, conducted daily primarily to remove chicken and other animal droppings.

Cooking and reheating of food were enhanced by availability of water, firewood and time. Water and firewood were accessible by the households and if not, getting them would be prioritized among the household chores. Women collected water and firewood and brought home for use. Sometimes, women would buy firewood and this influenced the number of times mothers prepared and reheated food. Caregivers mentioned that they would pluck vegetables from the fields and if they had money, would buy "omena" (sardines) to supplement.

Caregivers had different methods of storing their food. These ranged from using metallic cooking pots, plastic jugs, plastic cups, metallic hot pots and thermos flasks. Observations showed that caretakers often stored their food inside the house, sometimes up on top of a cupboard. Other mothers hung their food from a traditional rope (a special rope designed to hold items tied mostly on roof) to keep it out of the way of dogs, cats, chickens and children. Food was cooked in large quantities and stored to save on cooking fuel and time for cooking. Food was covered by caregivers due to concerns about food contamination from household animals and flies; however, caregivers believed that food needed to cool before covering to prevent it from spoiling.

Utensils were cleaned at least once, and at different times of the day: 1) in the morning, 2) before cooking, 3) immediately after cooking (during the day), or 4) at night after cooking. This was dependent on the time that the caregivers had during the day and their engagement in other chores. Utensils were cleaned in designated places, and these included outside the house but within the compound, in the kitchen and at the lake. Utensils were dried on a rack and if not, alternative places like plastic crates, portable trolleys, basins, or hanging them on rope or the fence would be used. At home, caregivers dried utensils where they could not be carried by wind or licked by

animals. When caregivers did not wash their dishes, they usually stacked them together with other dirty dishes somewhere in the yard. One mother put her unwashed cooking utensils underneath an "otete" (mobile chicken cage) to prevent chickens and other household animals from accessing the dirty dishes, and also to prevent people from thinking that her house was unclean.

> *"When I go to the lake with the utensils, I carry three basins, one big basin which carries all of them, two other basins where I am going to wash them in… I first put cups, wash and rinse then put in the big basin then I wash the plates and dishes and put there then I get to the sufurias (cooking pots) I scrub and after scrubbing, I will arrange them all in the big basin and bring them home. I have a crate at home and a table in my kitchen, so after coming with them from the lake, I arrange in that crate in the kitchen." Mother, Homa Hills*

Lack of physical opportunity was experienced by caregivers in Homa Bay. For instance, getting firewood within the neighborhood around the hills was a problem since the hills were guarded by the government and participants reported that it was a government policy not to cut trees from the hills. Lack of money and affordability influenced the kind of food prepared in the household which was in most cases kales, "omena" (sardines) and "ugali" (bread made from corn). In terms of washing food, participants stated that when they are in the market, on a journey or away from home, they would eat some foods like fruits without washing because of lack of environment to wash them, showing the relationship between psychological capability and lack of physical opportunity. Additionally, some participants lacked drying racks, having been destroyed by animals, but used other alternative solutions to ensuring that their utensils were dry before taking them to the house. Environmental factors like high temperatures contributed to caregivers not always covering some foods after preparation or when storing. Participants indicated that if some

foods were covered then they would go bad. These included meats, fish, "githeri" (a mixture of maize and beans), vegetables like kales, legumes like beans and green grams (lentils). According to observations, only 4 households out of 12 had food covered at the time of the visit.

> *"I also fry kale after cooking everything…I take it and go cover, or hang it on a rope or put in the cupboard. Before you will reach lunch, you are forced to reheat it because you fried it with onions…If you cover it, it will go bad." Mother, Sori*

Social opportunity

Social opportunity included interpersonal influences, social structures, cultural norms, religion and role sharing by caregivers. Typically, mothers were responsible for cooking and reheating food, a common social norm. Most caregivers reported preparing food three times a day although from observations, this was never the case as expressed by a mother, "*in this house I do my day's food preparation that's breakfast and lunch all at once."* Participants also shared roles within the household such that if one was engaged in one chore, the other person took up the other. Caregivers shared cooking roles within the household. Teenagers would be taught how to cook as they grow up in addition to other household chores. Older children in the household would prepare tea but not ugali in some instances because it would not cook well. Children also washed utensils under the guidance of their mothers, focusing on future benefits of early training. Mothers in law cooked for their daughters-in-law when they just delivered a child. Co-wives would cook together once the husband brought food home. Resource sharing was practiced by caregivers: one participant mentioned that she could be given money by neighbors and would use that money to buy soap for cleaning utensils demonstrating an emphasis on social relationships. Value being placed on food preparation was seen when participants expressed their need to use the basin designated for

washing utensils as opposed to the basin designated for bathing while washing food. However, the reasoning behind it was not mentioned.

> *"How I prepare this banana, I put it in a trough, I take another trough or a clean sufuria, not bathing trough, it is a utensils trough that you can even pack your food on which you had prepared, then you put it down with water..." Mother, Sori*

Cultural norms and religion influenced caregivers to reheat food. Foods like "githeri", boiled sweet potatoes, boiled maize, were preferred to be eaten when cold; a behavior typically practiced by the elders of the caregivers. Seventh day Adventist and "Roho" faithful followed a church doctrine preventing them from lighting a fire in a compound on the Sabbath day. They thus prepared meals on Friday evening which could last them through Saturday evening posing risks of food recontamination.

Lack of prioritization was seen when people purchased soap for washing clothes, dishes and personal hygiene but not specifically for handwashing. Some participants had separate soap for cleaning cooking pots which they called the "black soap" noting that this soap made the cooking pots sparkle and shine. Additionally, handwashing was not a strongly established norm for children and adults thus creating a barrier to establishing behavior. However, at times people adapted to a lack of handwashing soap and used other low- or no-cost materials for handwashing including ash.

> *"I agree, you can take even two days before seeing soap with your eyes, we wash our hands, I am able to buy water, but soap, it can take even two days when you just wash your hands with water alone without soap". Grandmother, Homa Hills*

Motivation

Motivation is defined as all those brain processes- habitual or emotional that energize and direct behavior, not just goals and conscious decision- making. Motivation is further defined as *reflective motivation,* which involves self-conscious planning, reflection, intentions and evaluations; whereas *automatic motivation* involves processes involving wants and needs, desires, impulses and reflex responses (Michie et al., 2011)

Reflective motivation

Caregivers exhibited reflective motivation, when evaluating the process of thoroughly cooking food as well as making plans to get water and firewood. Caregivers indicated that porridge is cooked until it boils, removed from fire so that it doesn't pour out, returned on fire and left to boil until the foam cleared indicating their well thought of evaluation process of properly cooking food.

> *"I like after-when I want to prepare porridge, I light up the fire take enough water that I will use to prepare it, I take a jug, I take enough flour and pour there, I stir well and pour it, when it is maize flour after pouring the water I stir well until it is well mixed, and when it is boiling and almost ready and it bubbles up I add water, I add sugar if I have, and if I also have lemon I add and I leave it to boil because maize flour must boil well until all the bubbles disappears and it is then that I remove it and pour inside a big jug." Mother, Homa lime*

Caregivers also prioritized getting water and firewood among the household chores. Additionally, caregivers reported that handwashing with soap would prevent them and the children from "eating germs" thereby preventing children from getting illnesses like "diarrhea and cholera."

However, due to other competing priorities, caregivers were unable to prioritize certain issues related to proper food hygiene. For instance, based on caregiver's conscious decision, high priority was placed on getting food compared to reheating or cooking fresh foods for children. These opportunity challenges created a lack of reflective motivation for handwashing as caregivers lacked specific places to wash their hands.

Automatic motivation

Automatic motivation was a driver to cleaning utensils: disgust drove most actions. One participant was critical about leaving dirty utensils outside the house, noting that these would attract flies from the latrine which would then land on the utensils, a sight she never wanted to see. Some caregivers mentioned that they would wipe their utensils with towels designated for wiping utensils before storing them. These towels would then be washed to avoid attracting "small flies" from landing on the towels, a sight expressed as disgusting by participants. However, a lack of reflective motivation was seen with some caregivers who prioritized other roles compared to cleaning utensils.

> *"When I want to clean utensils, I do that in the house … when I was young, I was taught that when cleaning utensils outside where latrine in nearby, and you leave them unwashed outside as you still rearrange your house, latrine flies can land on the utensils…" Mother, Sori*

DISCUSSION

This study explored the facilitators and barriers to practicing proper food hygiene and preparation behaviors including handwashing habits, food preparation and cooking practices, and food storage. We learned about these behaviors during observations and discussions with caregivers of CU2 in Kenya. Using a well-grounded theory of behavior change, we applied COM-B domains (Michie et al., 2011) to identify opportunities for designing interventions to be integrated into the CRS THRIVE II care group model (Freeman et al., 2020; Jacob Arriola et al., 2020).

Key findings

- Facilitators to food hygiene and preparation practices among caregivers were capability and motivation, including the ability to wash hands at critical times, knowledge to wash hands, wash food, cook food and cover food and clean and dry utensils.
- Barriers to food hygiene and preparation practices included lack of psychological capability, including caregivers and children not washing hands with soap at critical times, lack of perceived importance of washing some foods before eating and not knowing the perceived risks of storing food for more than four hours.
- Opportunity related barriers included lack of resources (soap, water, firewood) and enabling environment. For instance, caregivers lacked enabling environment to practice hand washing thus low motivation to practice the behavior. Time constraints due to work, competing priorities, socio cultural norms and religion hindered the practice of food hygiene and preparation behaviors.

The results from this study contributed to the design of interventions aimed at addressing food hygiene and preparation practices (Jacob Arriola et al., 2020). We noted that caregivers had the psychological capabilities for food hygiene and preparation practices including handwashing before handling food and feeding children, washing food before eating or cooking, cooking and reheating food, covering and storing of food and cleaning of utensils and food preparation surfaces.

However, reflective motivation to practice those behaviors were hindered by lack of psychological capability to perform specific behaviors, and physical and social opportunity. These formative results informed a WASH and nutrition intervention grounded in the COM-B theory of behavior change. The findings suggested adding minimal inputs to enable behavioral change, including information, education and communication materials (pledge cards and food hygiene cards), and hardware (washbasin, pitcher and soap for handwashing stations and mesh food covers) (Freeman et al., 2020). The intervention implementation based on this formative research resulted to improvement in hygienic food preparation outcomes and handwashing practices (Freeman et al., 2020). Studies elsewhere also recommend innovation of interventions based on culturally acceptable and locally available and low-cost interventions. Evidence from these studies showed an increase in handwashing practices among women after involving community health workers in providing hygiene messages to mothers through household visits (Curtis et al., 2001; Takanashi et al., 2013).

Our study indicated capability as a facilitator of food hygiene and preparation practices. Caregivers learnt about handwashing from their school going children. Caregivers demonstrated knowledge and skills to ensure food was cooked well, reheated before consumption and covered. Knowledge and experience of cleaning utensils was predominant among the caregivers. Automatic motivation, expressed through disgust associated with presence of flies on dirty utensils and the knowledge of flies being potential carrier of germs facilitated cleaning of utensils.

However, reflective motivation (prioritization) was a barrier to cleaning utensils, similar to results from a study in Malawi (Chidziwisano, Slekiene, et al., 2019).

Handwashing without soap at critical times was a common practice for children and caregivers in these communities. Children's hands were seldom washed, and handwashing was only done if

there was visible dirt, similar to findings from studies elsewhere (Nizame et al., 2016; Parveen et al., 2018). Food preparation practices in these communities involved the use of hands, a common practice in other low and middle-income countries (Mumma et al., 2020; Nizame et al., 2013; Toure et al., 2013). Unwashed hands can be a source of fecal contaminants to foods prior to handling or preparation (Kennedy et al., 2011). Unwashed hands, contaminated from contact with other foods (cross-contamination) or through fecal contact that occurred during cooking, can be sources of enteric pathogens, (Nizame et al., 2016). From observations, only one caregiver used soap for handwashing before food preparation, similar to observation data from a study in peri urban Kenya (Davis et al., 2018). Evidence suggest that handwashing with soap maybe a particularly acceptable and feasible practice to target (Curtis et al., 2001). In our context, emphasis on the importance of soap for handwashing may be valuable, which could then increase motivation to prioritize and use soap for handwashing and further enhance the self-efficacy of caregivers. Additionally, caregivers in this setting didn't see the importance of washing foods raw mangoes, potatoes contrary to a study in Africa and Asia which reported washing of fruits and vegetables before consumption (Odeyemi et al., 2019). This practice presents the possibility of ingesting bacteria and other contaminants acquired through unhygienic handling of the fruits and vegetables in the markets or farms.

Caregivers' economic context and not knowing the negative effects of certain practices influenced their ability to practice certain behaviors. For instance, food was prepared in large quantities to last for the whole day when the caregiver had to leave for work, similarly reported in a study elsewhere (Mumma et al., 2020). Although evidence show that leaving food sitting for long periods of time provides an opportunity for growth of pathogens (Ehiri et al., 2001), caregivers may have lacked this knowledge. Uncovered food was also a barrier to protecting food from contamination: foods

like fish, kales, beans were not covered as they were thought to go bad. In tropical climates such as that of Kenya, storing food for extended time provides ambient temperature for bacterial contaminants growth (Davis et al., 2018; Mumma et al., 2020) which could be exacerbated by uncovering food.

Lack of physical opportunity including access to soap, water, time, and cues to trigger action contributed to lack of handwashing for both children and adults (Chidziwisano, Slekiene, et al., 2019; Curtis, Cairncross, & Yonli, 2000; Mumma et al., 2020; Nizame et al., 2016). In this context, caregivers washed their hands and the children's hands without soap. Our findings further pointed out lack of handwashing stations near the food preparation areas, similar to results from a study in a peri urban settlements in Kenya (Tsai et al., 2019). Although these two contexts are within the same geographical region, the settings were quite different with varied exposures; however, the practice was similar. Studies on food hygiene have recommended considering structural barriers, local practice and culture, communication messages and identifying critical control points to facilitate appropriate target of resources in appropriate measures to promote food safety (Bigson, Essuman, & Lotse, 2020; Chidziwisano et al., 2019; Curtis et al., 2001; Ehiri et al., 2001; Nizame et al., 2016). Furthermore, evidence suggest that availability of infrastructure is a strong indicator for a successful performance of desired targeted behavior (Seimetz, 2016)(Chidziwisano et al., 2020). Enabling environment (water and time), contributed to participants' inability to wash food before eating, even though they had knowledge and motivation to practice the behavior. Evidence has shown that fruits and vegetables can be contaminated with gram-negative bacteria, in the farm or on their transit to the market and thus suggest that hygienic practices would prevent ingestion of those microbes (Zekar et al., 2017). However, caregivers in this study discussed a lack of opportunity to wash food when in places such as the market, journey, or farm.

Due to lack of physical and social opportunity – for instance, availability of firewood and work demands reheating food was not well achieved (Gautam et al., 2017; Touré, Coulibaly, Arby, Maiga, & Cairncross, 2013). Food was kept for four hours or more and sometimes not reheated before feeding to children. Some foods like "githeri" (a mixture of maize and beans) were believed not to be reheated and once cooked should be eaten like that. The longer that food remains unheated then consumed, the greater the exponential increase in harmful microbes. Reheating food is therefore important in ensuring that these microbes are killed before the food is consumed. Although the use of a wooden rack was a recommendation by the Ministry of Health, many caregivers lacked one citing challenges with animals breaking them. However, due to the importance placed on drying utensils, caregivers used existing alternatives addressing the lack of physical opportunity.

One of the most influential aspects of determining caregiver behavior is social norms (Ellis et al., 2020). Norms including church doctrines hindered caregivers from reheating food on specific days; as cultural practices contributed to caregivers storing food for longer than four hours. Storage of food at an extended period at ambient temperature has been associated with increased bacterial contamination especially in tropical climates like in East Africa (Mumma et al., 2020; Tsai et al., 2019), and as such, these norms and cultural practices facilitate these practices. Addressing such rooted norms maybe a challenge and may require sensitization of community educators like the religious leaders to understand the risks and health impact of not practicing food hygiene and preparation practices, and further engage them together with the community health volunteers in facilitating behavior change messaging within their communities.

In our study communities, women bear the burden of the household responsibilities related to food hygiene and preparation. Women were responsible for fetching water, going to the farm to look

for vegetables, burning charcoal for household cooking fuel and selling, and managing small businesses and other income-generating activities while also cooking and taking care of the children and the husband. Women had to prioritize which activities they would be involved in. Relieving women from the burden of taking up all the household responsibilities may help in improving food hygiene practices in the household. This can allow women to prioritize proper food hygiene practices including thoroughly cooking food, reheating food, and cleaning utensils immediately after use. This study revealed that care for children is a collective responsibility especially when it comes to feeding. This practice has also been reported in other low-income countries (Chaudry, 2006; Mumma et al., 2020; Samman et al., 2016). Based on these evidence, future interventions on food hygiene could be gender inclusive for instance, using family approach as a strategy to reduce the workload on women. To facilitate the additional time of performing household chores, men should be encouraged to assist their families with tasks like collecting water, getting firewood, assisting in the farms and providing for families. Other nutrition studies have demonstrated that male involvement have contributed greatly to decision making on complementary feeding, and grandmothers' involvement in provision of positive social support improved some infant feeding practices (AD, NK, & K, 2018; Mukuria et al., 2016). Such interventions can be adopted to enhance behavior change.

Strengths and Limitations

A strength of this study was that both interviews and observations were used in the data collection. This was helpful in verifying practices and ensured that our findings were grounded in participants' experiences. The two-day observations in the same households were helpful in reducing observer influence on participants' behaviors since the participants were accustomed to observers' presence and may have returned to their natural interaction by the second day. However, the timing for our

observations (determined by the families and community health volunteers) limited us in observing major cooking events and related food hygiene practices which happened earlier than 9am and later than 4pm. Caregivers were also occupied by other responsibilities which led to them leaving the CU2 under the care of someone else while attending to those responsibilities. This narrowed the focus of the observation as caregiver related behaviors would be minimal. Although we were able to get rich data with an understanding of caregivers' behaviors, attitudes and perceptions that determined food hygiene and preparation practices, some subjectivity, reliability and generalizability were experienced. Challenges with subjectivity, being that the researcher is the instrument, was minimized by the researchers practicing reflexivity, being aware of their influence on data collection and analysis process thus being able to reduce bias. Reliability was also minimized by daily debrief sessions which were held during data collection and involving different researchers in the data collection and analysis process which was helpful in moderating the understanding of data. Due to our small sample size, generalizability of the study was deemed to be a challenge however, having a theoretical understanding of food hygiene and preparation practices based on the study context would facilitate replication of the thought process being that behavior is naturally driven and even in different environment, humans might behave the same way. The understanding of the underlying reasons could be generalized to address specific challenges in different settings.

Conclusion

This study demonstrated that myriad facilitators and barriers contributed to optimal caregiver practices related to hygienic food preparation and safety. The use of COM-B domains – capability, opportunity, and motivation – further highlighted the relationship between the domains with a clear indication of how one category influenced the achievement of a practice with the other domain.

Categorizing these determinants using the predetermined COM-B behavior change theory supports the development of a theory-informed intervention (Ellis et al., 2020). Caregiver ability to practice certain behaviors were influenced by physical and psychological capability; physical and social opportunity; and automatic and reflective motivation. Limited knowledge of the how and the importance of practicing certain behaviors including handwashing with soap especially the child's hands, reheating of food and covering food influence the ability to practice those behaviors. Motivation to practice certain behaviors was also impacted by social opportunity including time, work demands (Ellis et al., 2020) and social norms. Additionally, contextual factors including lack of water due to distance to water source, firewood and sometimes money also affected motivation to practice certain behaviors. Addressing these challenges would require an integrated intervention which does not only focus on one domain but all the three domains together with focus on using innovative approaches which are locally available, accessible and relatable to the communities to overcome these challenges.

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Appendices

Appendix 1

Mother/Caregiver of CU2 FGD Guide

Objectives:

Maternal Nutrition

Objectives: Describe societal/cultural, environmental, family, and individual drivers/barriers of:

- Nutrition practices during pregnancy.
    - Domains: social/cultural norms; availability; accessibility/cost; priority; decision making; knowledge; agency; trusted sources of information

Infant and Young Child Feeding

Objectives: Describe societal/cultural, environmental, family, and individual drivers/barriers of:

- Hygienic, adequate, and appropriate young child complementary feeding behaviors.
    - Domains: social norms; social/cultural beliefs; availability; cost/accessibility; hardware availability; water availability; soap availability; drying rack availability; disagreement; knowledge; agency; ability

Notes:

- Exact wording of questions will change based on feedback from local research assistants.
- Snacks can be distributed either in the middle or end of the FGD. This is at the facilitator's discretion.
- Prior to FGD, participants will be read the consent form and will be asked if they would like to voluntarily participate. Participants will be provided with numbers and must fill out demographic forms once they have consented. Full details to be found in the SOP

Setting Ground Rules

Opening Questions

Opening questions are intended to build rapport and gradually lead-in to primary/key questions

Opening Questions: Introductions

Each team should come up with a basic icebreaker or some closed questions that each person in the group can answer.

Facilitator Script: Let's go around and have each participant tell us

1. How many children they have?
2. What they might do in a typical day? (Make sure to cover this thoroughly)
3. Facilitators can use other icebreakers or conversation starters as appropriate

Food Card Sorting Activity

Materials: Food cards. Include a few blank cards that could be filled out on the spot if participants feel like certain foods are missing.

Facilitator Notes: Show participants the food cards. Ask the participants if the foods on the cards are consumed in the community. Remove any cards that are not consumed. Ask the participants if there are any commonly consumed foods that are missing from the cards. Use the blank cards to create cards for these foods (write the name of the food, these cards will not have pictures).

Ask participants to sort cards into the categories (see questions 1- Once the participants are finished sorting the cards ask them to discuss why they sorted them that way.

The note-taker should record the number of the food cards for each sort on the data collection sheet and add additional notes.

1. Sort by Source	• **Produced by the home** • Gathered from the wild • Purchased in the market
2. Foods always available vs seasonal	• **For seasonal, when are they available?** • What might affect availability?
3. Affordable/not affordable	• **You may probe on "modern" vs "traditional"**
4. Important for pregnant women to eat? Facilitator Notes**: After they have created this pile, from the remaining cards, ask "Which are important for pregnant women not to eat?"**	• **Why?**
5. Important for lactating women to eat? Facilitator Notes: After they have created this pile, from the remaining cards, ask "Which are important that lactating women should not eat?"	• **Why?**
6. Reserved for men to eat	• **Why?**

Follow up Questions

Who decides what food should be purchased?

- **Why?**
- Control of financial resources with HH?

Who purchases food for the home?

- **Why?**
- If different than the person who controls finances, why?

Who decides what should be cooked?

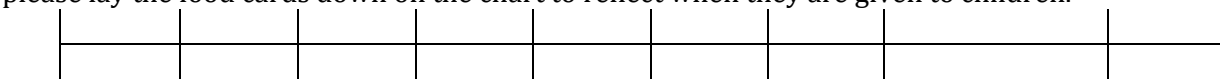
- **Why?**

What happens in a household if there is not enough food for everyone?

- **Who gets food?**
- Who does not get food?
- Who gets fed first? Last?
- What happens when there is no food and no resources to get more?

Lifeline Activity

Facilitator note*: Lay out the Lifeline Activity Chart.* **Facilitator Script:** "Now I would like to know about when young children begin to eat these foods. As we go through the food cards, please lay the food cards down on the chart to reflect when they are given to children."



Which of these foods are typically given to infant shortly after birth or within the first week?	• **Why?**
When do families begin giving other foods?	• **Why?**

NOTE – they may not put anything before 6 months and may say that they are not supposed to give anything before 6 months as that is the recommendation that is pushed and they may not want to identify as violating the recommendation; however if you note that nothing is being placed prior to 6months you can ask them whether they know of families that do give foods or drinks before 6 months They will likely say yes so you can ask when those families typically start giving other drinks / foods and which ones. For each food placed before 6 months, **ask the reasons for why that food might be started at that time.**

If families were recommended by a health worker to give only breastmilk in the first 6 months, (that means not even water or very thin uji,) what challenges (related to exclusive breastfeeding) would they face?	• **How could those challenges be addressed?**
What would make it easier for families to give only breastmilk to infants for the first six months?	•
Who in the household would be most important to support a mother to give breastmilk?	• **Why?**
Are there any foods that children can only eat for a certain amount of time?	• **Why? Which foods?** • When do they stop eating these foods?

Note for facilitator: For foods that are not started in the 6–9-month window but are delayed to later ***ask about the different foods and why they are delayed to the indicated age*** *– this is especially critical for nutrient dense foods such as eggs, meat, fruits, vegetables, legumes. If there are foods not included at all on the timeline ask why these foods are not included.*	
If families were recommended by a health worker to give [XXX] beginning in the 6th/7th month what challenges would they face?	• *Go through each delayed food group* ***– eggs, meat, peas / beans, nuts, fruits, vegetables – may be categories or may be specific foods that are nutritious*****}** • Social norms • Cost • Availability • Accessibility • Picky eater
What would make it easier / more acceptable for families to give these foods to infants beginning in the 6th or 7th month?	•
When does the child get their own food?	•
When does the child eat from the family pot?	•
Facilitator Script**: Now I would like to talk a bit more about the foods given to infants 6-9 months of age – you have listed here uji (or other porridge, depending on what is listed). I would like to know more about how this food is prepared –**	
Can you describe for me how most families make this porridge?	• **Please talk through ingredients-how much liquid, how much flour** • **What is typically added?**
How thick do families make their porridge for infants at this age?	• **Why?** • Instructions? Where did you learn? • From whom? • Availability? • Cost?
(If thin/watery) if families were recommended by a health worker to give their infants thick porridge (use picture) beginning at the 6th/7th month what challenges would they face?	• **What would make it easier/more acceptable for families to give thicker porridge to infants beginning in 6th or 7th month?**
About how many times in one day are infants in this community fed porridge?	•
How would people feed the porridge to their infant?	• **Why?**
About how much are infants fed at each meal?	• **How do families know when their babies have had enough?**
Who is the main person to feed the child?	• **Who helps sometimes?**
Thank you. Now we'd like to talk a little about the preparation of food. You all said that _____ is a typical food that is given to children under 2 (pick a cooked food).	
When do mothers make this food?	• **Time of day** • Number of times a day (once and then stored?

	• Whether baby is hungry (how do they know)
Can you walk me through all the steps that mothers take when they make this food?	• **Handwashing** • Washing of food (why? how?) _ • Boiling water/cooking food all the way • Cutting food • Dishes for preparation • Where the food is put when prepared? • Where the food is put if there is any left over? • How to clean up afterwards?
How would a person feed their baby/child this food?	• **Responsive feeding** • **Different techniques** • **With a spoon** • **Cover if baby takes break from eating**
How would a mother clean up any dishes used in preparing the food?	• **Water (clean)?** • Soap? • Leaves? • Drying? • Location of washing? • **Location of drying?**
Decision making and influencers	
How do families decide which foods to give to infants and when to give them?	• Break this out by age – in the first week of life? • In the first 6 months? • After 6 months?
Who in the family do mothers turn to for advice on how to feed young infants – for example which foods to give, when to give those foods and how much to feed?	• Why do they turn to those family members?
Who do they go to in the community when they have questions about how to feed their young children? Why do they turn to those community members?	• Why do they turn to those community members?
Where else might mothers learn about how to feed their infants?	• Friends / neighbors with young children, • media, • teachers, • religious leaders, • traditional birth attendants, • health care workers, etc.
Of all the ways mothers can learn about how to feed their infants, which ways do they prefer?	• Why?

THRIVE program participation	
Would you be interested in attending support group sessions to talk about challenges women experience with other mothers and a counselor?	• Preferred frequency within a month for mothers to attend group sessions i.e. once a month, twice a month, every week • Preferred duration of the sessions for mothers i.e. half hour, one hour, hour and half, two hours? • Likelihood to participate in a home visit session for your household i.e. very likely, attend some sessions, unlikely to attend? • Barriers to supporting participation • Recommendations
What would you like to learn about from a program focusing on pregnant women, mother of young children and young child health? What kind of role would you like to have in this program?	• Probe why and how. What is your interest in learning about 1) health and feeding practices, 2 how to maintain a clean environment for your baby; 3) water and sanitation practices that promote health • What would facilitate your participation in the program? • What are some barriers to participation? • What recommendations can you give to sustain positive practices in caring for children below 2 years? Pregnant mothers?
What would make this program successful?	• What would you like to see that will tell you the program is successful?
Before we end our time, I want to ask if you have any questions or other thoughts you would like to share with me. (Allow room for thoughts, questions, comments) Thank you so much for your time.	

Appendix 2

FGD for Mothers WASH

Toilet Use

Objectives: Describe societal/cultural, environmental, family, and individual drivers/barriers of:

- The presence and use of ~~improved~~ household toilets and places to wash hands.
    - Domains: social norms; availability; cost/accessibility; decision making; knowledge; ability

Child Feces Disposal

Objectives: Describe societal/cultural, environmental, family, and individual drivers/barriers of:

- Disposal behaviors of infant and young child feces.
    - Domains: social norms; shared cultural beliefs; availability of toilet; availability of pottys/training mats/trowels, etc.; decision making; knowledge; ability;

Hygienic Play Areas

Objectives: Describe societal/cultural, environmental, family, and individual drivers/barriers of:

- hygienic play behaviors (creating a protected, hygienic play environment for the infant; deter contact between animals and young children; ensure children don't play in areas frequented by animals.
    - Domains: social norms; availability; cost/accessibility; resource (raw materials) availability; support; decision making; knowledge; ability; perceived negative consequences

Deworming

Objectives: Describe societal/cultural, environmental, family, and individual drivers/barriers of:

- deworming behaviors for children >1 year, women of reproductive age, and pregnant and lactating women.
    - Domains: availability; accessibility; knowledge; agency; personal beliefs/trust;

Notes:

- Exact wording of questions will change based on feedback from local research assistants.
- Prior to FGD, participants will be read the consent form and will be asked if they would like to voluntarily participate. Participants will be provided with numbers and must fill out demographic forms once they have consented. Full details to be found in the SOP

Setting Ground Rules

Facilitator Notes:
Facilitator should discuss ground rules with the participants. Facilitators should brief participants to:

- Put their phones on silent. If participant needs to answer the phone, they should quietly leave the room.
- Take care of their consents (place out of the way)
- Say their number before sharing their thoughts and opinion
- Speak one at a time
- Be aware that their participation is voluntary. If they need/choose to leave at any point, that is allowed.
- Be aware that there is no right or wrong answer. This is a participatory exercise and all are expected to participate.
- Protect confidentiality. All responses shared in the FGD should not be shared with anyone outside of the group.

Facilitator Notes:
The facilitator can ask people to contribute their own ground rules to the group as well. Ask if people have any questions before beginning.

Opening Questions

Opening questions are intended to build rapport and gradually lead-in to primary/key questions

Opening Questions: Introductions

Each team should come up with a basic icebreaker or some closed questions that each person in the group can answer.

Facilitator Script: Let's go around and have each participant tell us

4. How many children they have?
5. What they might do in a typical day? (Make sure to cover this thoroughly focusing on women's activities related to water, sanitation and hygiene)
6. Facilitators can use other icebreakers or conversation starters as appropriate

WATER, SANITATION AND HYGIENE

Activity: Discussion of Sanitation Facilities

Defecation Locations	

Where do _____typically urinate?
• Men
• Women
	• Women
	  • Pregnant
	  • After giving birth
	  • Lactating
	  • Menstruating

Where do _____typically defecate? • Men (old, young, boy) • Women (young unmarried, married, old woman)	• Seasonal? • Time of day? • Women (pregnant, after giving birth, lactating, menstruating)

Where do children in the community usually urinate?	• Young child (infant) • Child close to 2 years?

Why do people prefer toilets to urinate and defecate? Not prefer?	• **Benefits?**
	• **Negative Consequences**-what might happen if someone is not urinating and defecating in the toilet? Consequences for
	  o Individual
	  o Household
	  o Community
	• **Time**. Different preference for toilet or open defecation depending on time
	• **Place.** Home/out and about
	• **Sharing.** Are there people who might not share toilets with each other? People in a family who would use a toilet and people who would not?

What would people say if they knew someone was defecating in the open?	
Child Feces Disposal	
Where are all the places a CU2 might defecate?	**Notetaker instructions:** Make a list • Is there anywhere else you can think of?
What places are • most common? • Least common? • Best? • Safest?	• Why?
What influences where a child defecates?	• Age? • **Access** to latrine • **Access to potty**, supporting tools • **Care of child**- Who is watching child? When? Different in day? Night? • **Time of day?** • **Convenience** Locations that are easier to clean? Which are easier/harder to clean? • **Location**: Home/away? • **Safety**
When are children old enough to use a toilet?	• Who teaches children? When? • Barriers?
If a family has access to a toilet, are there times when the child will not use the toilet?	• Why?
Feces Disposal and Cleansing	
What are some reasons that you don't dispose of a childs' feces in the toilet?	• Time • Cue to Action. Where is it normally put? • Where is it commonly disposed? • Left in open. Why? How do you feel about this? • Why might people who have a toilet not dispose of children's feces there?

What do you think is the safest way to dispose of child feces?	•
When do disposal practices change over time?	• Season • Time of day • Age of child (ability to walk) • Diarrhea
What are typical ways that child feces are transported?	• Clothes • Hands • Leaves • Tools • potties
Who usually disposes of children's feces in a household?	• Who else might help? • How might the person impact the disposal method?
What are different ways to clean a child's bottom after they defecate?	• Different materials? • Most common? • What do you think is safest?
Where might the water that is used to wash soiled (from poop) clothes, rags, or potties be disposed?	•
What about cloth or rags, what happens to these?	• Washed/reused • Disposal
Sanitation facilities-Resource Allocation	
What motivates a family in this community to have/build a toilet?	• Barriers to toilet ownership • Physical Environment • Sustainability • Available hardware? • Affordable? • Decision-making-who decides whether to spend money to get a toilet? • Messaging
Do some people in this community share toilets?	• How many people? Who shares toilets? Who does not share toilet?
In your community, what are toilets usually made of?	• Why? Barriers to toilet building? • Hardware? • Maintenance? Time? Knowledge? •
Who is normally responsible for cleaning toilets?	• Why? • Does this change when there are more people using?

Maternal and child handwashing

Can you describe how mothers typically wash their hands?	

What about young children's hands, are they washed in a similar manner as adults? Why or why not?	• Babies • Children under 2 • Who washes children's hands? • **Age** At what age do children wash their own hands?
Instructions for Facilitators: As participants answer the next questions, in their notes, the notetaker make a chart on a sheet of paper that lists mother in one column, baby in the second column, the times before activities in the third column, and the time after activities in the fourth column. The facilitator should prompt in the following order:	
Can you tell me about all the events that occur in a day when it is necessary for mothers of CU2 to wash hands?	• "A mother will wash her hands *before* she _____?" Why? • "A mother will wash her hands *after* she _____?" Why
When are important times for mothers to use soap when handwashing?	• Are there certain events where a mother would use soap? Why?

When are times when it is necessary for CU2 to wash hands?	• "A mother will wash her childs' hands *before* she _____?" Why?
	• "A mother will wash her childs' hands *after* she _____?" Why
	• **Probe for**
	  ○ Eating (mother)
	  ○ Feeding a child
	  ○ Preparing food
	  ○ Farming
	  ○ After coming in contact with animals
	  ○ Defecating
	  ○ Washing a child's bottom after defecation

When is it a good time for a mother to wash her_____ 's hands with soap?
• Baby
• CU2
	• Why?
	• Potential benefit?
	• Potential harm
	  ○ Self
	  ○ Others
	  ○ HH
	  ○ Community?

After the participants have listed important times for mothers and children under 2 to wash hands, the notetaker should put up the chart for mothers so they can see any differences. The facilitator should compare the two columns and probe on differences between the times mothers and babies wash hands and when they might use soap during a handwashing event.	
What are barriers to hand-washing?	• **Time.** Self, child. • **Affordability.** Soap • **Accessible.** Where does water in your community come from? • **Theft.** Soap, hardware • **Maintenance**. Water, station, etc.
Where do mothers wash their hands? Can you please describe the places/hardware?	• **Different places** • **Hardware/facilities.** Basin, infrastructure, lake, tippy tap.

	• Near toilet? • Who else uses?
Where does the water come from?	• **Primary Source?** • **Accessibility/Distance.** Where is the water source located? • **Alternative sources of water.** Seasonality • **Responsible?** • **How often replaced?**
Where does the soap come from?	• **Type**. What kind of soaps do people use? • **How often replaced** • **Affordable** • **Decision making.** Who decides whether to spend money on soap? Why?
How common is it for toilets in this community to have water and soap near them?	• **Why/why not?** • **Barriers**
Household Water Treatment	
You said previously, that people got water for handwashing from_____ (refer back to previous section.) What is the primary source of people's drinking water?	• **Accessibility/distance** Where in relation to people's homes? • **Alternative sources of water.** Seasonality. Different sources for different purposes. • **Responsible.** Who gets water? • **How often?**
What do people do to make their water safe for drinking?	• **Treatment.** Bleach, Pur, water guard • **Boil.** If boil, how do you boil the water to make it safe? How do you know when it is safe? • **Filter.** • **Rainwater**
What makes it difficult for people to treat water?	• **Affordability.** • **Prioritization.** • **Perceived negative consequences** • **Time.** • **Knowledge** • **Attitudes/Beliefs** • **Accessibility** • **Resources/Hardware (**think about how this relates to the other probes)
How do you store your drinking water?	• **After treating?** • **Hardware.** • **Recontamination.** How do you get water from the storage container? • **Cleaning.** How often do people clean their drinking water storage container? • **Time.** How long does the water stay in the storage container? Different times for different storage containers?

Hygienic Play Area	
Where do babies in the community play inside family compound (outside the family dwelling)? Inside the home/family dwelling? Tell me about where babies play when they are outside the family compound?	• What age do children start playing outside the home? • Who helps take care of the baby during the day? Who watches the baby when they are playing? • Beliefs/Social norms Can you please describe a place for babies to play that is clean? Can you describe a place that babies may play that is unclean? • How do you define the difference between the unclean and the clean place for babies to play? • What are things that could get babies sick? Why do children in the community get sick? • What are some ways CU2 in the community get sick? • Why might it be good for babies to play in the yard (other unclean space)? Why might it be bad for children to play in the yard? Not have their own special place to play? • Does anyone ever talk about creating a safe, clean place for children to play? What do they say? • Are there materials in the community to create clean play areas for children? • Can they be accessed by community members? • How willing do you Do you think mothers would be willing to spend money to create a clean, safe play place for their child? • How willing do you think Do you think fathers would be willing to spend money to create a clean, safe play place for their child? • How would you create a clean area for your baby to play? • How would mothers keep it clean?

Deworming	
What do you think about worms?	• When do you think worms are an issue/problem? (Specific ages, gender, etc)
What do you know about that can be done to prevent worms?	• Who told you about this?
What do you know that can be done to treat worms?	•

Tell me if you think this medication has been given to mothers in the community? (Sample box for deworming medication) Do you know what it is used for?	• What does de-worming medication do? Who should receive deworming medication? • Can women take deworming medication during pregnancy? Who does the mother learn about deworming from? Who does the mother trust? Is deworming medication okay for the baby? • Should pregnant women receive deworming medication? If yes, then when? • Should lactating women? If yes, then when? • Women of reproductive age? If yes, then when? • Children <1 year? If yes, then when? • Children >1year? If yes, then when • Who else should get treatment? • Where in the community can you get deworming medication? • What are barriers to participating in deworming? Availability? Cost? Accessibility? • Are there any specific days where you know deworming medication is being distributed? How do you know this? • Who usually brings the child to deworming days?
Would you be interested in attending support group sessions to talk about challenges women experience with other mothers and a counselor?	• Preferred frequency within a month for mothers to attend group sessions i.e. once a month, twice a month, every week • Preferred duration of the sessions for mothers i.e. half hour, one hour, hour and half, two hours? • Likelihood to participate in a home visit session for your household i.e. very likely, attend some sessions, unlikely to attend? • Barriers to supporting participation • Recommendations
What would you like to learn about from a program focusing on pregnant women, mother of young children and young child health? What kind of role would you like to have in this program?	• Probe why and how. What is your interest in learning about 1) health and feeding practices, 2 how to maintain a clean environment for your baby; 3) water and sanitation practices that promote health • What would facilitate your participation in the program? • What are some barriers to participation? • What recommendations can you give to sustain positive practices in caring for children below 2 years? Pregnant mothers?
What would make this program successful?	• What would you like to see that will tell you the program is successful?
Before we end our time, I want to ask if you have any questions or other thoughts you would like to share with me. (Allow room for thoughts, questions, comments) Thank you so much	

Appendix 3

FOCUS GROUP DISCUSSION GUIDE**: GRANDMOTHERS**

Objectives:

- Understand how fathers perceive infant and young child feeding (IYCF), water sanitation and hygiene (WASH), and deworming practices in targeted communities
- Understand the roles and responsibilities that fathers understand themselves to have related to IYCF, water sanitation and hygiene and deworming practices
- Determine current knowledge, attitudes and practices on infant and young child feeding (IYCF), WASH, and deworming in the targeted communities

Setting Ground Rules
Facilitator Notes: Facilitator should discuss ground rules with the participants. Facilitators should brief participants to: • Put their phones on silent. If participant needs to answer the phone, they should quietly leave the room. • Take care of their consents (place out of the way) • Say their number before sharing their thoughts and opinion • Speak one at a time • Be aware that their participation is voluntary. If they need/choose to leave at any point, that is allowed. • Be aware that there is no right or wrong answer. This is a participatory exercise and all are expected to participate. • Protect confidentiality. All responses shared in the FGD should not be shared with anyone outside of the group. **Facilitator Notes:** The facilitator can ask people to contribute their own ground rules to the group as well. Ask if people have any questions before beginning.

Opening Questions	
1. Please tell us about a typical day in your life. From when you wake up to when you go to sleep?	• Responsibility: What are your activities and responsibilities? Why? How long have these been your responsibilities? • How do your responsibilities relate with those of other people in your household? • Value: How do your responsibilities contribute to the well-being of your household? Your community? Do members of the home value grandmother/father? How? How do grandmothers/fathers feel appreciated? • What do you do with any leisure time?

	• What do you enjoy most about your responsibilities? Least about your responsibilities?
2. I'd like you to tell me about your responsibilities in taking care of a child from the time it is born to when it is 2 years.	• What are your responsibilities when the child is born? A few weeks of life? • When the child is growing up, from 6-12 months? • **Decision-making**. What kind of decisions do you make in your household? What kind of decisions may change when the mother is pregnant? When it is the first child? When the child grows? • **Time.** What times do fathers stay with the children? • **Socio-cultural Beliefs.** When you were growing up, what did you see as the role of fathers? What difference do you see now (from how things were when you were a child? • **Value.** How do people in the household value fathers? How does they feel when they share their experiences? How do people appreciate fathers?
Scenario: Now I want you to imagine a woman in your community named Emily. (For elder women, this may be someone like your daughter in law or daughter, for men, imagine Emily to have similar experiences to your wife or sister).	
Now I want you to imagine a woman named Emily. She is pregnant with a child. (For both)	• How does Emily's diet change, if at all, while she is pregnant? • What foods might Emily eat that will be different than the rest of the family? Special foods? Taboo foods? • Does Emily eat more food than she would normally eat or less food than she would normally eat? Why? • Who prepares the food for her? • **Knowledge** How does Emily know which foods she fathers/grandmothers should/shouldn't eat? • **Cost Does** cost define the foods that Emily will eat? • **Decision Making** Who decides who will eat which foods? Taboo foods? Special foods for certain people? How much food for certain people? • How will Emily's diet change after she has the baby? While she is breastfeeding? • What would be fathers/grandmothers role in assisting/supporting Emily during this time?
In the time right after Emily gives birth, how are she and the baby taken care of? (For GM)	• Where would Emily give birth? • Who would be with Emily to help her? • Who will tell her what to do and how to care for the baby? • How will she be cared for in the weeks after the baby is born? • When thinking about the responsibilities of the household as spoken about above, are there things that other people may do for Emily for some time? Who? For how long?

	• What would be fathers/grandmothers role in assisting Emily during this time?
FOR GM ONLY: Once the baby is born, who helps Emily to feed the child?	• **Beliefs-Feeding?** • **Early Initiation/Skin to skin contact**: What happens between the time Emily's baby is born and the time s/he is first put to the breast? How much time will pass? Cultural/religious/health care practices • Other than breastmilk, what else might Emily give her baby to eat / drink in the first few days of life? Why? • Other than breastmilk, what else might Emily give her baby in the first few months of life (honey, water, medicines, animal milk, thin porridge tea, etc.)? Why? What about if it is the dry season? When does this happens? • When will Emily begin giving her baby thin porridge? Why at that age? • Knowledge. How does Emily learn about how to feed her baby? Who advises her? Who teaches her? • **Perceived negative consequences-** What Do you all think are the consequences in giving only breastmilk to the child for the first six months of life – this means no water, animal milks, teas or thin porridge at all. • **What challenges might Emily have giving only breast milk for the first six months?** How common it is for women in this community to have a hard time producing enough milk? How do women know they are not producing enough milk? How do women know their child is hungry? What strategies do women take to try to increase their breastmilk production? • **Time** Do women have time to breastfeed while maintaining their other responsibilities in the home? When the baby is still very young, a few months old, what are some reasons Emily might need help to feed her baby? (Work outside the home, school, Time due to household chores). • **Social Norms/Childcare** Who in the household is most likely to help Emily feed the baby when she needs help or is not available to feed the baby? What will they feed Emily's baby (emphasize that the baby is only a few months old)? • What would be fathers'/grandmothers' role in assisting/supporting Emily during this time?

(GM Only) Now the baby is getting bigger…	• **Age** At what age will Emily's baby begin to eat thick porridge or other semi-solid or soft foods? Why at this age? • **Social cultural beliefs?** - other than breastmilk, what foods are needed to help a baby grow? When are babies first given these foods (at what age or developmental sign)? Why not earlier? What makes it possible for women to give these foods when they do? (Probe on fruit, beans, eggs and meat. When are they given to children? Why?) • **Affordability**. How does cost play a role in determining what Emily's baby will eat? • **Responsibility.** Who usually feeds Emily's baby, now that s/he is a bit older (9-12 months)? What happens if Emily is not available to feed the baby – she has gone to the field or travelled for the day. Who feeds Emily's child? What will they feed the child? • **Perceived positive and negative consequences-** Is there a specific amount that will help the baby grow • What would be fathers/grandmothers role in assisting/supporting Emily during this time?
Thank you very much for helping us think through the scenario of Emily and the child, now we'll talk through some questions related to sanitation and hygiene in the community	

Child Feces Disposal	
Facilitator Note: At this point you should refer back to the map of the compound that was made earlier to discuss the different places for child defecation and feces disposal. As you are going through these questions, ask people to show you on the compound map where children defecate.	
Where are all the places a CU2 might defecate?	**Facilitator instructions:** Ask • Is there anywhere else you can think of?
What places are • Most common? • Least common? • Best? • Safest?	• Why?
What influences where a child under 2 defecates?	• Age? • **Access** to latrine, • **Access to potty**, supporting tools • **Care of child**- Who is watching child? When? Does this differ in day? Night? • **Time of day?** • **Convenience** Locations that are easier to clean? Which are easier/harder to clean?

	• **Location**: Home/away? • **Perceived negative consequences:** Do you believe that child feces do not contain germs? Up until what age? • **Safety**
When are children old enough to use a toilet?	• Who teaches children? When? • Barriers?
If a family has access to a toilet, are there times when the child will not use the toilet?	• Why?
Feces Disposal and Cleansing	
What is done with child feces? Why are they handled this way? **Facilitator Note:** As you go through the next set of probes asking about locations of child feces, ask the participants to show you these locations on the map of the compound from the earlier exercise. • Cue to Action. Where is it normally put? • Where is it commonly disposed? • Left in open. Why? How do you feel about this? • Why might people who have a toilet not dispose of children's feces there? • How is it moved/transported (if children are not using toilet)? o Clothes o Hands o Leaves o Tools o Potties • What kind of cleaning up happens after children defecate?	
What do you think is the safest way to dispose of child feces?	•
How do disposal practices of children's feces change?	• Season • Time of day • Age of child (ability to walk) • Diarrhea
Who usually disposes of children's feces in a household?	• Who else might help? • How might the person impact the disposal method? Child vs mother?
What are different ways to clean a child's bottom after they defecate?	• Different materials? • Most common? • What do you think is safest?
Where might the water that is used to wash soiled clothes, rags, or potties be disposed of?	•
What about cloth or rags, what happens to these	• Washed/reused • Disposal
Who in the family decided about whether to construct a toilet? Why?	• Barriers to toilet ownership • Available hand-ware? • Affordable?

	• Sustainability • Environment. Does the environment/land influence whether people may build a toilet or not? • Decision-making. Who decides whether to spend money to get a toilet? •
Do some people in this community share toilets? Who?	• How many people? Who shares toilets? Who does not share toilets?
What are toilets usually made of?	• Why • Hardware? • Maintenance? • Time • Knowledge
Who is normally responsible for cleaning toilets?	• Why? • How often are the toilets cleaned? • Change when there are more people using?

Grandmother/father and child hand-washing

Can you describe how fathers/grandmothers typically wash their hands?	•
What about young children's hands, are they washed in a similar manner as adults? Why or why not?	• Babies • Children under 2 • Who washes children's hands? • When do children wash their own hands?
Instructions for Facilitators: As participants answer the next questions, in their notes, the notetaker makes a chart on a sheet of paper that lists mother in one column, baby in the second column, the times before activities in the third column, and the time after activities in the fourth column. The facilitator should prompt in the following order	
Can you tell me about all the events that occur in a day when it is necessary for grandmothers/fathers of CU2 to wash hands?	• "A grandmother/father will wash her hands *before* she/he _____?" Why? • "A grandmother/father will wash her hands *after* she /he_____?" Why
When are important times for grandmothers/fathers to use soap when handwashing?	• Are there certain events where a grandmother/father would use soap? Why?

When are times when it is necessary for CU2 to wash hands?	• "A grandmother will wash her childs' hands *before* she _____?" Why?
	• "A grandmother will wash her childs' hands *after* she _____?" Why
	• **Probe for**
	  ○ Eating (grandmother)
	  ○ Feeding a child
	  ○ Preparing food
	  ○ Farming
	  ○ After coming in contact with animals

	○ Defecating ○ Washing a child's bottom after defecation
When is it a good time for a grandmother fathers to wash her/his_____ 's hands with soap? • Baby • CU2	• Why? • Potential benefit? • Potential harm ○ Self ○ Others ○ HH ○ Community?
Instructions for Facilitators After the participants have listed important times for mothers and children under 2 to wash hands, the note-taker should put up the chart for mothers so they can see any differences. The facilitator should compare the two columns and probe on differences between the times mothers and babies wash hands and when they might use soap during a handwashing event.	
What are some times that you don't wash your hands that you should? Could you tell us about the last time that happened?	• **Time.** Self, child. • **Affordability.** • **Accessible.** Where does water in your community come from • **Theft.** Soap • **Maintenance**. Water, station, etc.
Where do mothers wash their hands?	• **Different places** • **Hardware/facilities.** Basin, infrastructure, lake, tippy tap. • Near toilet? • Who else uses?
Where does the water come from?	• **Primary Source?** • **Distance.** Where is the water source located? • **Alternative sources of water.** Seasonality • **Responsible?** • **How often replaced?**
Where does the soap come from?	• **Different kinds of soap** • **How often replaced** • **Affordable** • **Decision making.** Who decides whether to spend money on soap? Why?
How common is it for toilets in this community to have water and soap near them?	• **Why/why not?** • **Barriers**
Thank you for discussing the practices related to sanitation and child feces disposal in your village. Now we will be moving on to discuss the ways in which mothers and other household members might be involved in programming that would teach them about some of the issues that we've discussed today.	
Would you be willing to support/allow participation of mothers in your household to attend support group sessions to talk about challenges women	• Preferred frequency within a month for mothers to attend group sessions i.e. once a month, twice a month, every week

experience with other mothers and a counselor?	• Preferred duration of the sessions for mothers i.e. half hour, one hour, hour and half, two hours? • Likelihood to participate in a home visit session for your household i.e. very likely, attend some sessions, unlikely to attend? • Barriers to supporting participation • Recommendations
What would you like to learn about from a program focusing on pregnant women, mother of young children and young child health? What kind of role would you like to have in this program?	• Probe why and how. What is your interest in learning about 1) health and feeding practices, 2 how to maintain a clean environment for your baby; 3) water and sanitation practices that promote health • What would facilitate your participation in the program? • What are some barriers to participation? • What recommendations can you give to sustain positive practices in caring for children below 2 years? Pregnant mothers?
What would make this program successful?	• What would you like to see that will tell you the program is successful?

Before we end our time, I want to ask if you have any questions or other thoughts you would like to share with me. (Allow room for thoughts, questions, comments) Thank you so much for your time.

Appendix 4

Observation guide: **Feeding and WASH Observation**

The observations are intended to give insight into the IYCF, food hygiene and WASH behaviors that caregivers practice at home. As such, in each country, we would rely on the local personnel to inform us when we should begin the observation: it is critical for this observation to capture food preparation. Whether people cook their main meal in the morning, afternoon, or evening may be determined during training or the piloting of this tool. The first observation will take place over 6 hours, the second observation will take place over ~8hrs. The first observation matters, but serves primarily for the caregiver to become comfortable with the observer and to make a comparison. On both the first and the second day the observer is to fill out this form. In addition, they should also be making notes in notebooks to inform their detailed field notes. For the feeding events, including breastfeeding, food preparation and complementary feeding, you may need to fill out more

than one sheet, as you should be filling out for each incident/event that occurs. While the intent is to have you watching the child interact with the primary caregiver (assumed to be the mother), should the primary caregiver split from the child for any reason (to leave the compound for any period of time) your focus should continue to be the index child and the person who is caring for the child. In the written notes, the observer should make note of any significant change in behavior or environment from Day 1 to Day 2.

Background

Name of the community:
Date of observation dd/mm/yyyy
/ /
Name of field worker:
Day of observation: First Second

First and last name of child being observed (if available)
Child's age in months: Child's sex: M F
Child is crawling? (Y) (N) walking? (Y) (N) Can sit on the ground independently? (Y) (N)

Breastfeeding (only for children breastfeeding)
Researchers need to fill this out for each breastfeeding event.

1. Is there a child breastfeeding? Y N
2. What time was the event?_____
3. In what way is the caretaker interacting with the child while they are breastfeeding?
4. When do they pay attention to the child?
5. When do they not pay attention to the child?
6. For how long does the infant breastfeed (in minutes)? Does the infant come off of the breast on his/her own or is the infant taken off the breast by the mother?
7. If the infant comes off the breast on his/her own, does the mother attempt to re-latch?
8. Did the caregiver or mother appear to face any challenges with breastfeeding?

8a. For the child:
8b. For the mother:

Food Preparation
Researchers need to fill out for each and every event. This includes but is not limited to reheating of food, heating of milk, preparation for one member of the family, preparation for whole family

1. What time was the event_____
2. What food(s) was/were prepared? Which ingredients does this include?
3. Who was the food prepared for? (specifically for the child, for the whole family)
4. Does the caretaker prepare the food fresh (i.e. Was the food made from scratch or did they use food that had been left over from previous meals? (Yes) (No)
5. If no, how long has the food been sitting out? _____minutes (if known)
6. If no, how was the food stored before serving? i.e. high, covered, in cooking pot, in separate dish?
7. If applicable, was the food thoroughly reheated before feeding?

8. Please describe the process of the food preparation in details. (If the food was prepared fresh, were vegetables and meat prepared in separate places? Was the food washed before preparation? If it wasn't washed, was the food boiled? For how long?)
9. How was the food served? (What are the utensils used? Do they look clean?)
10. If breastmilk is being reheated,

Complementary Feeding of the Child

What was the time of the event?

1. Age of person feeding the child (generally, is this an adult, child, elder person):
2. Sex of person feeding the child: M F
3. During mealtimes when serving the food, did the caregiver:
    a. Wash her own hands before serving the child? (Yes) (No)
    b. Wash the child's hands (Yes) (No)
    c. Serve the child first (Yes) (No)
    d.
4. Child eats: a) by himself/herself b) with family members (Please add details)
5. How is the child fed during mealtimes (tick that which describes the majority of the feeding experience)?
    a. The child feeds self without assistance from the caregiver ( )
    b. The child mostly feeds self but received help from caregiver ( )
    c. The child is fed mostly by caregiver but sometimes feeds self ( )
    d. The child is fed only by caregiver (does not touch food or utensils) ( )
6. Is the child served food on his/her own plate (Yes) (No)?

7. Which is used to feed the child / does the child use to eat (tick all that apply)?
    a. Spoon or fork ( )
    b. Caregivers or other person's hands ( )
    c. Child's own hands
    d. Bottle ( )
    e. Other (specify) ( )

9. Which best describes the caregiver during this feeding (tick that which applies the most)?
    a. Caregiver is near (within 1 meter) the child and attentive to the child ( )
    b. Caregiver is near but not attentive to child ( )
    c. Caregiver is not near the child but is still engaging the child verbally ( )
    d. Caregiver is not near the child and is doing something else / not engaged with child ( )

Food, dishes and drinks served to child:

10. Are certain food, dishes or drinks served only to the child (not to other members of the family)?

11. If so, which types of food, dishes or drinks?

12. Are there certain foods that are not fed to the child, but are fed to other members of the family? (Look especially for protein rich foods)

13. Is the child only served portions of the foods, or drinks that are served to the rest of the family, or are special foods prepared for the child?

14. What foods or drinks are served only to the child?

14. At any point during the entire household observation period does the child use a bottle with a nipple? (Yes) (No)

How does Caregiver Motivate Child to Eat?

1. How does caregiver verbally motivate the child to eat (if caregiver does not talk to child then indicate caregiver does not verbally motivate the child) What does the caregiver say to the child? What is the caregiver's tone (i.e. encouraging, harsh, reprimanding)?

2. How does the caregiver physically motivate the child to eat (if does not physically motivate then indicate)? For example, does the caregiver use hand gestures/signals, play games, or by demonstrating how to eat?

3. During the meal, does the child ever refuse the food? YES NO
4. If yes, how does the caregiver respond?
5. During the meal, does the child have any other difficulties? YES NO
6. If yes, describe?
7. If yes, how does the caregiver respond?

8. Does the caregiver ever force-feed the child (i.e. holds the child's mouth open and feeds child) ? YES NO

9. Does the child eat all of the food he/she is served? YES NO
10. Does the caregiver serve additional portions to the child?

What does the caregiver do with any leftovers?

11. How does the caregiver spend her time when the child is eating?

12. Other aspects related to the feeding

13. General observations about hygiene during food preparation and handling

After eating

1. Please describe what the caregiver does with any dishes used for eating, cooking etc. when complete? Are they washed? Where? How are they dried? Where are they stored?

2. Is food put away? How much time passed before the food was put away?
3. Is food covered? How much time passed before the food was covered? Please remark on any/all times this occurs throughout the observation?

Water handling

1. What do people in the household use water for throughout the day?
    A. Drinking (how much? Source?)
    B. Cooking
    C. Cleaning
    D. Personal hygiene
    E. Washing clothes
    F. Watering plants
    G. Watering animals
    H. Other

2. Did you observe anyone fetching water?

Please describe. Who is responsible for doing this? What do they use to collect water?

3. Did you observe anyone treating the water used for cooking/drinking in any way? (boiling, water guard, sand filter, adding bleach, etc.) Who is practicing this behavior?

4. Did you observe anyone fetching water from a storage container? How did they do it? Did they use a utensil or dip their hands?

5. Did the child drink water? YES NO
6. Was the water treated in any way (sieved / filtered, boiled, chlorinated) before being given to the child? YES NO
7. IF yes, how was the water treated?
8. Was that water provided from a clean glass? YES NO

Hygiene/Handwashing Event. In addition to filling out these tables, please also write details describing how the index person washed their/the child's hands? How long did they wash? Where did they wash? What was the process (handwashing station, jug and water, basin, was the water poured, etc.)

Potential Caregiver HW event[1] **Handwashing** (Y/N) **Soap**(Y/N) **Dry**(air dry/clean cloth/dress/other)

1.
2.
3.
4.
6.
7.
8.
9.

*Note all handwashing events and what took place either before or after. If nothing specific, please note

Potential Child HW event[1] **Handwashing** (Y/N) **Soap**(Y/N) **Dry**(air dry/clean cloth/dress/other)

1.
2.
3.
4.
6.
7.
8.
9.

*Note all handwashing events and what took place either before or after. If nothing specific, please note

Other HW event[1] **Who?** **Handwashing** (Y/N) **Soap**(Y/N) **Dry**(air dry/clean cloth/dress/other)

1.
2.
3.
4.
6.
7.
8.
9.

*Note all handwashing events and what took place either before or after. If nothing specific, please note

[1] **HW events example:** after toileting, before eating, after eating, after cleaning, before food preparation, before breastfeeding, after changing baby, after handling animals, before feeding child, nothing specific

General hygiene

1. Did you observe anyone putting water or soap out for handwashing?

2. Who in the household is wearing shoes? At what times are they wearing or not wearing shoes?
3. Is the child wearing shoes?

Sanitation

4. Did you observe the child defecating? Is the child wearing a nappy or diaper? What does the caretaker do with the child's feces after defecation? Look and comment on location of disposal, method of disposal, and any cleaning up done of child, materials or hands post clean-up.

5. Which members of the household did you observe using the toilet? How many people are using the toilet throughout the day? Who is using it? Is there any place to wash hands close to the toilet? Is there water and soap there? Did they do anything specific before or after using the toilet (put on shoes, clean, etc)

6. Did you observe anyone cleaning the toilet? Who? With what?

Child play areas

Where was the child in the compound?
Where are they playing/sitting/etc?
Is the area free from fecal contamination?
Is anyone playing with the child?
Is anyone watching the child throughout the day?
Was the child placed on a mat?
Was child ever on unimproved/dirt area?
Did the child come into contact with any animals?
What objects did you observe the child putting in her/his mouth?

Are there animals kept on the compound? Which ones? Where? Does the child come into contact with animals throughout the day? What type of contact?

Child Care

Who was taking care of the child throughout the day (by % time. Should add to 100%)
_____% Mother
_____%Father
_____%Sibling (age)
_____%Grandparent
_____%Other_____