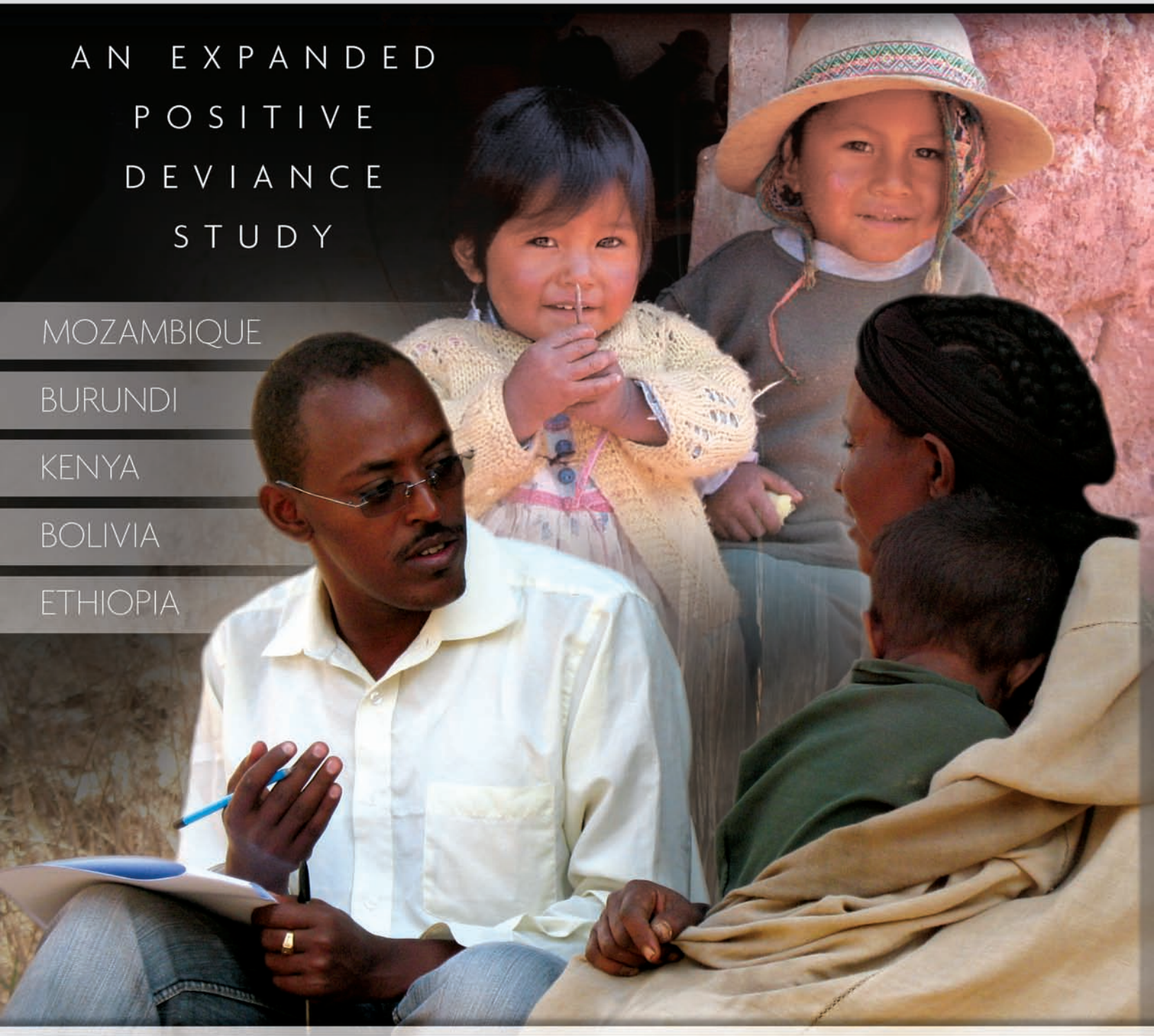
LOCAL DETERMINANTS OF MALNUTRITION

AN EXPANDED POSITIVE DEVIANCE STUDY



MOZAMBIQUE

BURUNDI

KENYA

BOLIVIA

ETHIOPIA

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FROM THE AMERICAN PEOPLE

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Local Determinants of Malnutrition: an Expanded Positive Deviance Study

I. Background on the Approach and Development of the Study Instruments and Protocol

A. Background

Positive deviance studies from many countries have shown that there are often local determinants of child malnutrition, and local coping mechanisms for preventing child malnutrition. Some causes of malnutrition (e.g., lack of exclusive breastfeeding) are found in many countries where malnutrition is a problem. Other causes, however, are found in some countries, but not in others. Some causes of malnutrition may eventually be found in many countries, but have only been studied in a few countries at this point in time.

Currently, most positive deviance (PD) studies have focused on foods that make up a child's diet (food types, but not quantities or frequency of consumption), and assessing the "three goods": Good feeding practices, good child care practices, and good health care seeking practices (e.g., use of growth monitoring/promotion [GM/P] services). However, there are numerous other factors – and specific behaviors that fall into these three categories – that are associated with child malnutrition in some countries and have not been explored to date in most PD studies.

Examples of previously under-investigated but important factors include depression in the mother[1], intake of specific nutrients (e.g., magnesium, potassium and phosphorus[2]), domestic abuse, and alcoholism among family members. For some of these, scientific studies have shown a relationship in some countries, but little has been done to measure or quantify the effect in developing country settings. Little has been done to explain these associations to private voluntary organizations (PVOs) as well, so they can include interventions to combat these potential causes of malnutrition. For others, only anecdotal evidence exists and more study is needed. More needs to be known about the links between these local determinants and food insecurity so that we can do more to combat these causes of malnutrition.

One reason for this under-investigation is that it was previously assumed that little could be done to change the situation – in developing countries – when problems with mental illness, substance abuse (e.g., alcoholism), or certain nutrient deficiencies were found. This is changing, however, as new interventions related to these and other problems are tried out in developing countries. For example, World Vision recently carried out a low-cost project in Uganda to decrease depression. Community-level workers were taught to work with people in

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1 See Carvalhaes MA, Benicio MH. (2002) Mother's ability of childcare and children malnutrition. Rev Saude Publica 2002 Apr;36(2):188-97. This study found correlations between depression in the mother and malnutrition in the child. Depression is the leading burden of disease in women in Latin America.

2 See Golden, M.H. (1988) The role of individual nutrient deficiencies in growth retardation of children as exemplified by zinc and protein. In: Linear growth retardation in less developed countries, pp. 143-163. Ed. Waterlow, J.C. Raven press, New york. Also see, http://www.univ-lille1.fr/pfeda/Engl/Frame/ IndexE.htm where Dr. Michael Golden states, "[W]e should not be tackling this [malnutrition] problem by only giving type I nutrients (micronutrient bullets) some protein and energy. The forgotten type II nutrients [NB: e.g., magnesium and potassium] are critical.

groups for "talk therapy" which decreased depression by 92% (as compared to a 42% reduction in a control group – which indicates that some depression will resolve on its own accord).[3]

The Local Determinants of Malnutrition study (and the workshops based on it) was made possible through an Institutional Capacity Building grant (AFP-A-00-03-00008-0) from USAID as part of its Title II Food for Peace program. The study was designed to respond to the priority areas of reducing food insecurity in vulnerable populations by selecting or developing innovative tools to assess vulnerabilities and predict and mitigate food security risks and shocks, capacity building of food security partners, and collaboration to create an evidence base and best practices in Title II programming. This study fits with FH's goal of increasing the impact of FH's Title II food security programs in reducing food insecurity via the promotion of innovative technical capabilities within FH and improving core competencies of its food security partners. Specifically, this study helps to achieve our objective of:

- selecting or developing innovative, high-quality tools to assess food security vulnerabilities and predict and mitigate food security risks and shocks in vulnerable populations; and
- training staff in the use of these tools.

FH conducted Local Determinants of Malnutrition workshops in Mozambique (September 2004), Kenya (September 2005), Bolivia (August 2007), Ethiopia (May 2008), and Burundi (September 2009). During these workshops, participants learned how to carry out this "expanded PD study" that helped them to identify potential local determinants of malnutrition which may increase a child's vulnerability to food insecurity. The statistically significant findings from these studies can be found in Table 1.

A brief summary of the LDM study: Mothers of well nourished children and mothers of malnourished children are interviewed with an LDM questionnaire. Children are classified as PD if their weight for age Z-score (WAZ) is greater than -1, and classified as malnourished if their WAZ is less than -2. After the surveys, the data from these two groups is compared to determine how the two groups differ on each question and scales based on series of questions. The data from these studies is providing Food for the Hungry with more insights into what practices and foods should be promoted in each country context, and what additional interventions should be considered in FH's health and nutrition programs.

Finding Associations, Not Causes

One thing that should be mentioned from the onset is that this sort of study helps one to find things that are *associated* with malnutrition. That means that they "co-exist" with malnutrition. For example, if you did a study and found that people who drink alcohol a lot are also angry, you could not be sure if being angry led people to drink, or if drinking led people to be angry a lot … or if both simply co-existed without a mechanism between the two (confounding).

However, finding out which factors are *associated* with malnutrition can be very helpful in identifying things that may very well be *causative* of malnutrition. It is important, though, to look for factors that are logically connected – via a mechanism – to malnutrition. For that reason, as part of this study, we have looked through the scientific literature to find things that are associated with malnutrition and thought to be causative of malnutrition because a mechanism for causation exists.

[3] See http://bjp.rcpsych.org/cgi/content/full/188/6/567

For example, it is known that people who are depressed often do not find much interest or pleasure in doing many of their usual daily tasks. They are also less responsive to the usual stimuli in their life (e.g., a child crying). It is possible to see a mechanism, therefore, whereby depression makes it difficult for a mother to do the things for her child that she may otherwise ordinarily do (e.g., feeding the child five times a day, washing her hands with soap). Since a possible mechanism can be seen, if it is found that mothers of malnourished children are also depressed, it would be worthwhile to see if treating the depression would help her to better care for her child. The next step in the scientific process would be to try out an intervention in a limited area and see if it helps to reduce malnutrition.

Local Determinants of Malnutrition Study (LDM) vs. Hearth

The LDM Study is an expanded positive deviance study but it is not a study that would be done as part of the Hearth nutritional rehabilitation model. In the Hearth PD study, it is important to concentrate on more basic causes of malnutrition. One reason for this is that mothers should be highly involved in carrying out the type of PD study done as part of a Hearth program. It is critical that they understand these causes and see the results of their actions. The questions used during the PD study which is part of the Hearth model are necessarily more limited and should focus on things that the mothers themselves can do to resolve the problem. For these reasons, we discourage organizations from using this type of expanded PD study (referred to in this report as the Local Determinants of Malnutrition Study) during their community-level Hearth rehabilitation program. Of course, some of the questions used in this type of study *may be* useful to include in the PD study which is done as part of Hearth, but one would definitely not use all or most of the questions that are part of this study.

The questions in this Local Determinants of Malnutrition questionnaire, however, may be helpful in identifying entirely new areas of intervention that an organization can take on to reduce malnutrition. It may also identify questions which should be used more routinely in Hearth PD studies. Ideally, this LDM study would be conducted at the beginning of a project period (as a stand-alone formative research study) in order to identify what messaging and interventions may be needed, and to identify important questions that should be added to the routine PD questionnaire used during Hearth. The most important changes needed in order to reverse malnutrition in an area will most likely continue to be changes in feeding practices, care of the child, and health care seeking behavior.

B. Literature Review

The following steps were conducted to create the LDM study questionnaire used in this study:

- The literature on causes of malnutrition was reviewed by Phil Moses, MPH and Tom Davis, MPH. They first examined positive deviance studies and then looked at other studies on malnutrition that provided information on the causes. They specifically looked for causes dealing with nutrient intake, feeding practices, and psycho-social causes.
- They then developed matrices that showed different types of possible determinants, the strength of the association, the feasibility of measuring it, the degree to which it was susceptible to change during a Hearth nutritional rehabilitation program, and susceptibility to change outside of a Hearth program (e.g., through a different intervention). Each of the possible determinants was scored. The determinants with the highest scores were then slated for inclusion in the questionnaire.

- A questionnaire was developed that included questions that have been used in other PD studies and ones that were developed by project staff when pretested questions were not available.

C. Findings from the Literature Review

(See Annex A, summarized matrices on determinants of malnutrition created by Mr. Moses and Mr. Davis. A more detailed matrix is available upon request from FH. A full list of citations for the research studies examined is provided in the more detailed version of the matrices.)

D. Methodology

The LDM study selects participants as would be done in a case-controlled study. Several communities are randomly selected from the entire project area to serve as data collection sites. From these sites, mothers who fit the selection criteria will be identified and asked to participate. As this is a case-control study and not a cross-sectional study, strict random sampling of participants was not necessary.

In order to implement the study, staff are divided into research teams. Each team is comprised of a supervisor, two triage members, and two interviewers. Triage team members are given refresher training on how to weigh children. During the LDM training workshop all of the students receive supervised practice time to solidify their interviewing techniques.

The mother-child dyads targeted for the study include children between 12 and 35 months of age, however, older children between the ages of 36 and 59 months can be included when there are not enough children in the younger age group found in the community that qualify for the study.

Before starting the process of identifying mothers to participate in the survey, the team supervisor gives a brief orientation to the community leaders and mobilized women as to the purpose and intended outcome of the LDM study. He/she reads and explains the informed consent statement to the mothers.

Triage team members work together to first weigh children. Mothers of children 12-35m are divided into three groups – those with a child who is well nourished (weight-for-age Z score (WAZ)>-1.0), those who are malnourished (WAZ<-2.0) and those who fall in between those two groups. The supervisors on the teams determine if the children qualify for the study based on their age and nutritional status using a table provided to them (one for boys and one for girls).

The mothers of children who are neither PD nor malnourished are thanked for their involvement, receive a brief health talk, and are sent home. The mothers who are included in the survey do *not* participate in this health talk or hear it since it might influence their responses. Mothers selected to participate in an interview sit together and are called out one-by-one for the interview.

At the start of the interview, the mother is asked to personally give consent using the informed consent statement. Mothers who choose not to participate are thanked for their time. (Usually all mothers choose to participate).The interviews with the caregivers of PD or malnourished children are carried out in the local language, and take place in private, but publically visible

locations to facilitate a safe environment for the caregiver to give candid answers. The questionnaires do not include information as to whether the mother's child is malnourished or PD in order to prevent bias on the part of the interviewer. (This information is added to the questionnaire by the triage personnel once the interview is complete.)

During the LDM interview, the mothers are asked questions about family demographics, income generating work, child feeding practices, foods that she consumed during pregnancy and breastfeeding, specific foods consumed by the child, child care practices, healthcare seeking behavior and home management of sick children, worldview, acceptance of child, support network, relationship with husband/partner, symptoms of depression, and hygiene practices.

Some of the questions in the survey are open ended, others are closed (e.g. yes/no responses). For the interviewer to best indicate the mother's response to the open ended questions, the questionnaire provides finite categories as possible answers. One question asks the caregiver (in the majority of cases this is the mother) to quantify the number of days in the past week that her child ate certain foods. The list of foods for this question are derived from the names for foods in the local language that people normally eat or might possibly eat, plus foods that are available in the market, and positive deviant foods identified in the literature that exist in the country. Another question allows the mother to free-list the foods eaten by the child in the last 24 hours.

Supervisors serve to maintain the flow of the triage and interviewing process, as well as checking the finished questionnaires for completeness. If there are any questions that are not filled in properly, the Supervisor asks the mother those questions before she leaves the area. The supervisors also periodically observe the interviews to make sure the interviewers were using the questionnaires appropriately. The purpose of this is to catch interviewing errors early on and rectify them. For example, some interviewers may be observed to not say "Anything else?" after multiple response questions. In response they are coached on their performance to assure that they do not repeat this error. After the first day of interviewing, the teams are brought together to deal with any issues they discovered during the data collection process and to clarify procedures.

The objective is to interview an equal number of mothers of well nourished and malnourished children, preferably an equal amount in each community. Once the interviewers are familiar with the questionnaire, the interviews take approximately one hour to complete. Over the course of two to three days, a team can interview an average of twelve caregivers of PD or malnourished children per day from the selected communities. After collecting all the data and prior to data entry, the questionnaires are once more reviewed to confirm that the PD and malnourished children have been correctly identified at triage.

E. Analysis of the Data

Data from the questionnaires is entered by the team members and tabulated using a program written by FH's Director of Health Programs for Epi-Info 6.04d. To minimize and control the amount of error introduced into the data set, the workshop trainers check 20% of the data entered into the computer against the written questionnaires to confirm that it is entered correctly. Data is checked after each set of 10 questionnaires are entered by a team. If even one meaningful error (e.g. not misspellings) is found in the data entered, the team members

are charged with checking all the data entered in that series. The trainers then recheck 20% of the set again, drawing the questionnaires to check at random (without replacement).
The statistical analysis program tabulates responses for each question and calculated scores (e.g., tolerance of abuse, social support, hygiene index) based on multiple questions. The PD and malnourished groups are compared to determine how they differ on each question and calculated scores. Differences between the PD and malnourished groups are considered to be statistically significant if the p value is less than 0.05, or if the range for the 95% confidence interval for the odds ratio (done as part of the analysis) did not include 1.0. (Uncorrected p-values [as opposed to Mantel-Haenszel or Corrected] are used for this purpose.) A majority of the statistically significant results are tested for confounding by age.

II. Statistically-Significant Findings

Table 1.

Statistically Significant Findings by Country

Determinant Categories	Mozambique	Burundi	Kenya	Bolivia	Ethiopia
Demographics					
Child's age			X	X	X
Principal language spoken by mother					
Gender of child					
Age of mother					
Whether father was alive and living with mother					
Current marital status of mother					
Family type (nuclear, extended, orphan)					
Number of siblings					
Mother's Income-generating work					
Mother doing cash work in last 12m		X			
Mother deciding how to spend money					
Roof construction (proxy for SES)					
Child Feeding Practices					
Child (ever) breastfed					
Initiation of breastfeeding (in hours after birth)		X			
Giving pre-lacteal feeds					
Currently breastfeeding		X			X
Age at complete weaning				X	X
Speed of weaning					
Exclusive breastfeeding to six months					
Introduction of solids in child's diet at 6-10m of age				X	
Bottle feeding (ever)					
Current bottle feeding					
Consumption of five or more daily feeds by child			X		X
Consumption of at least one snack daily				X	

	Mozambique	Burundi	Kenya	Bolivia	Ethiopia
Eating from a common plate					
Eating the same food as the rest of the family					
Child being fed by neighbors					
Mother having food taboos concerning foods a child should eat					
Mother having food taboos concerning foods she eats during breastfeeding				X	
Mother having food taboos concerning foods she eats during pregnancy				X	
Amount of food eaten during pregnancy (self report) compared with usual level of eating					
Size of child at birth (mother's report)		X		X	X
Complete emptying of breasts by mother during breastfeeding	X				
Iron supplements taken by mother during pregnancy and breastfeeding	X				X
Encouraging non-hungry child to eat	X	X			

Foods Consumed by the Mother during pregnancy and breastfeeding

Consumption of b-carotene foods during pregnancy					
Consumption of retinol-rich foods during pregnancy					
Consumption of B1 rich foods during pregnancy					
Consumption of B6 rich foods during pregnancy					
Consumption of B12 rich foods during pregnancy					
Consumption of zinc rich foods during pregnancy					
Consumption of protein rich foods during pregnancy					
Mothers regularly adding fat to their food during pregnancy.					
Mother's consumption of b-carotene foods during breastfeeding				X	
Mother's consumption of retinol-rich foods during breastfeeding		X		X	
Mother's consumption of B1-rich foods during breastfeeding					
Mother's consumption of B6-rich foods during breastfeeding		X		X	
Mother's consumption of B12-rich foods during breastfeeding					
Mother's consumption of zinc-rich foods during breastfeeding		X			
Mother's consumption of protein-rich foods during breastfeeding		X			

	Mozambique	Burundi	Kenya	Bolivia	Ethiopia
Regularly adding fat to mother's meals during breastfeeding					

Particular Nutrients

β-Carotene-rich foods				**X**	
Retinol-rich foods					
Iodine foods					
High-fat foods					
Foods rich in Inhibitors					
Iron-rich foods					
Zinc-rich foods					
Phytate-rich foods					
B12-rich foods					
B2-rich foods	**X**				
Potassium-rich foods	**X**				
Magnesium-rich foods	**X**				
Foods rich in Lycopene, flavonoids or flavonols					
Copper-rich foods					
Phosphorous-rich foods					
High protein foods					

Child Care Practices

Mother always takes child with her when outside of home					
Average age at which mother leaves child at home with someone else					
Average hours for which the child is away from the mother each day		**X**	**X**		
Person taking care of the child during the day					
Whether or not mother gives feeding advice to other caregivers					
Whether or not mother leaves food for the child when she goes out					

Healthcare Seeking Behavior and Home Management of Sick Children

Child ill during the past two weeks		**X**			
Child ill with diarrhea during the past two weeks	**X**	**X**		**X**	
Child ill with ARI during the past two weeks					
Child ill with fever or malaria during the past two weeks					
Child ill with an illness other than diarrhea, ARI, fever, or malaria during the past two weeks	**X**	**X**			
Child ill with measles during the past year					

	Mozambique	Burundi	Kenya	Bolivia	Ethiopia
Mother sought help for illness the last time the child was ill					
Mother sought help for the child's illness the same or next day					
Mother sought care for the sick child from a trained person					
Mother gives child same or more food during their last illness					
Mothers used an insecticide-treated bed net for the child					
Child dewormed in the past six months				X	X
Mother regularly uses iodized salt in the child's food				X	

Mother's (or Caregiver's) World View

Whether or not the mother believes that neighbors or other persons can make her child become malnourished, or mentions other "magic" causes					
Whether or not the mother believes that "a neighbor or another person in your community make a child lose weight by something that they do (e.g., curses, evil eye)"					
Whether or not mothers believe that malnutrition is a serious problem					

Mother/Caregiver's Acceptance of (and Responsiveness to) Child

Whether or not mothers wanted their pregnancy					
Whether or not the child was hit or spanked	X	X	X		X
Degree to which the mother says that her child has pleased her in the past month				X	
Average responsiveness score					

Mother/Caregiver's Support Network

Number of wives the mother's husband has					
Number of community activities mother has participated in over the past week					
Average social support score of mother (scale does not include caring for a family member with a chronic illness)	X				
Whether or not fathers contribute money to support the child					
How often the mother of the child visits or talks with other friends or family outside of the household		X			

	Mozambique	Burundi	Kenya	Bolivia	Ethiopia
Whether or not the mother says that anyone in the household has been very sick or bedridden for a period of more than three months	X				

Mother/Caregiver's Relationship with Husband/Partner

Mothers relationship to spouse (score)					
Whether or not the mother says that she is mostly or completely satisfied with her relationship with her husband					
Number of situations (from list) for which mothers say it is okay for a husband to hit or beat his wife (as a proxy for spousal abuse)					
Whether or not the mother says that she is mostly or completely satisfied with her relationship with her husband					
How often the mother says that she usually quarrels with her husband in a week					
Whether or not the mother or caregiver says that someone in their family needs to cut their alcohol consumption					

Mother/caregiver's Self-report of Symptoms of Depression

Depression symptoms score (using a six-item instrument).					
Whether or not mothers said that they felt depressed on half or more days of the week					

Hygiene Practices

Number of hygiene practices the mother or caregiver regularly teaches her child					
Hygiene index of mother's or caregiver's practices				X	X
Whether or not mother or caregiver claimed to have used soap or ashes in the past day or previous day for cleaning or washing					
Number of times mother or caregiver washed their hands with soap or ashes during the current or previous day					
Whether or not the child defecated in a proper place the last time s/he did so		X	X		X
Whether or not the mother or caregiver disposed of the child's feces in a proper place the last time the child defecated					
Whether or not the mother mentions proper water storage practices					

	Mozambique	Burundi	Kenya	Bolivia	Ethiopia
Whether or not the mother mentions a proper water removal practice when asked how she removes water from water containers in the home					
Number of practices mother or caregiver mentions concerning safe food handling and preservation				**X**	
Treatment of child's drinking water	**X**				

Specific Foods Consumed by the Child

Maize	Salt	Kale	NA	Wheat
Whole Grains	Organ Meats	Eggs		
Cassava	Taro	Milk		
Pumpkin				
Broccoli/ Cabbage				
Fish (any type)				
Beans				

Statistically-Significant Findings

Statistically-significant or nearly significant differences (e.g., p=0.06, CI included 1.0) found between PD and malnourished children are highlighted below.

1. ***Demographics***
   - Child's Age

   In Kenya, malnourished children were on average nine months older than PD children (p=0.002). (expected)

   In Bolivia, average age of the PD children was 26.5 months and the average age of the malnourished children was 21.1 months (p=0.058). (expected)

   In Ethiopia, average age of PD children was 37 months and the average age of malnourished children was 28.6 months. PD children were on average nine months older than malnourished children (p=0.0005). (expected)

2. ***Mother's Income-generating work***
   - Mother doing cash work in last 12m

   In Burundi, 39% of mothers of PD children said that they had done work for which they were paid in cash or in kind during the last 12 months. 21% of mothers of malnourished children said that they did this. (p=0.052) The odds ratio for this variable was 2.44 (0.89 < OR < 6.82) meaning that **mothers of PD children are more than twice as likely to claim that they are working for cash or gifts in kind**.

3. *Child Feeding Practices*

- Initiation of breastfeeding (in hours after birth)
- Currently breastfeeding
- Age at complete weaning
- Introduction of solids in child's diet at 6-10m of age
- Consumption of five or more daily feeds by child
- Consumption of at least one snack daily
- Mother having food taboos concerning foods she eats during breastfeeding
- Mother having food taboos concerning foods she eats during pregnancy
- Size of child at birth (mother's report)
- Complete emptying of breasts by mother during breastfeeding
- Iron supplements taken by mother during pregnancy and breastfeeding
- Encouraging non-hungry child to eat

In Burundi**,** 83% of mothers of PD children said that they initiated breastfeeding within one hour after delivery. 63% of mothers of malnourished children said that they did so ($p=0.032$). The odds ratio for the immediate breastfeeding variable was 0.34 ($0.11 < OR < 1.04$) meaning that **mothers of PD children are three times more likely to breastfeed within the first hour after birth**.

In Burundi, 52% of mothers of PD children vs. 83% of mothers of malnourished children reported that they were currently breastfeeding ($p=0.002$). The odds ratio for this variable is 0.22 ($0.07 < OR < 0.64$) which means that **mothers of malnourished children are four and a half times more likely to be currently breastfeeding compared to mothers of PD children**. This result warrants further investigation as it seems counter-intuitive. Further analysis revealed that these results were not confounded by age, even though the mean age for PD children was 27 months and the mean age for malnourished children was 21 months. Only 29.6% of the mothers of PD children with children 24-47m of age weaned their child before 24m vs. 15.8% of the mothers of malnourished children with children 24-47m of age. So the trend is to continue breastfeeding past 24m, and more so for children who are malnourished. Possible explanations are that mothers of malnourished children are choosing to continue breastfeeding *because* their child is malnourished or because they lack sufficient food to provide in lieu of breastmilk or because they are unaware of proper complementary feeding practices. ***In Ethiopia***, malnourished children were four times more likely to be currently breastfeeding: 47% of PD children and 78% of malnourished children were currently breastfeeding ($p=0.001$, $OR=0.25$, CI: $0.09<OR<0.65$). This finding was *not* confounded by the age of child.

In Bolivia, 42% of PD children compared to 58% of malnourished children stopped breastfeeding (e.g. weaned) early (before 18 months of age) ($p=0.03$). The odds ratio for this variable was 1.91 ($1.01<OR<3.63$). ***In Ethiopia***, 61% of PD children and 84% of malnourished children stopped breastfeeding early (before 18 months of age). ($p=0.009$, $OR=3.39$, CI: $1.2<OR<9.8$).

In Bolivia, 93% of mothers of PD children compared to 82% of mothers of malnourished children properly introduced solid foods to their babies between 6 and 10 months ($p=0.03$). The odds ratio for this variable was 0.35 ($0.11<OR<1.05$).

In Kenya, PD children consumed on average 3.4 meals per day whereas malnourished children consumed 2.9 meals per day (p=0.05) ***In Ethiopia***, PD children consumed on average 3.0 meals per day whereas malnourished children consumed 2.7 meals per day (p=0.02).

In Bolivia, PD children consumed on average 2.6 snacks per day whereas malnourished children consumed on average 2.2 snacks per day (p=0.015).

In Bolivia, 42.1% of mothers of PD children reported having food taboos while lactating compared to 4.8% of mothers of malnourished children (p=0.005). Also ***in Bolivia***, 32% of mothers of PD children reported having food taboos during pregnancy compared to 0% of mothers of malnourished children (p=0.005).

In Burundi, 91% of mothers of PD children vs. 71% of mothers of malnourished children reported that their infant was average, large, or very large at birth compared to other newborns in the community (p=0.01). The odds ratio for this variable is 0.23 (0.06 < OR < 0.86) which means that **mothers of PD children are four times more likely to claim that they gave birth to an average or above average sized baby**. ***In Bolivia***, 88% of mothers of PD children compared to 57% of mothers of malnourished children reported having an average, large, or very large child at birth (p<0.001). ***In Ethiopia***, 69% of mothers of PD children compared to 43% of mothers of malnourished children reported having an average, larger, or very large child at birth (p=0.009, OR=0.34, CI: 0.14<OR<0.85).

In Mozambique, 45% of mothers of PD children said that they usually or always completely emptied their breasts when breastfeeding their PD child. Only 10% of mothers of malnourished children said that they did usually or always do so. (p=0.006) The odds ratio for this variable was 7.09 (1.36 < OR <46.45) meaning that mothers of PD children were about seven times more likely to do this.

In Mozambique, 67% of mothers of PD children vs. 32% of mothers of malnourished children took at least one month of iron supplements during the months that they were breastfeeding. (p=0.04) The odds ratio for this variable is 4.05 (0.99<OR<18.83). Mothers of PD children were more than four times as likely to take iron supplements during breastfeeding as were mothers of malnourished children. ***In Ethiopia***, 39% of mothers of PD children compared to 18% of mothers of malnourished children took iron supplements during pregnancy (p=0.02, OR=0.35, CI: 0.12<OR<0.96). Also ***in Ethiopia***, Mothers of PD children took iron supplements an average of 0.66 months while breastfeeding whereas mothers of malnourished children took iron supplements an average of 0.20 months (p=0.02).

In Mozambique, 63% of mothers of PD children encourage their non-hungry child to eat vs. 94% of malnourished children. (p=0.007) The odds ratio for this variable was 0.12 (0.01 - 0.78). This warrants further investigation – it is counter-intuitive. It could be that mothers of malnourished children have received more health promotion on this as a result of the Hearth nutritional rehabilitation program or that they have more experience with their child being hungry. ***In Burundi***, 63% of mothers of PD children said that they encourage

their child to eat when s/he does not want to eat or refuses to eat. Only 38% of mothers of malnourished children said that they do so (p=0.01). The odds ratio for this variable was 0.35 (0.14 < OR < 0.89) meaning that **mothers of PD children were three times more likely to encourage their non-hungry child to eat than mothers of malnourished children**.

*Concerning feeding practices, other findings **in Bolivia** that were not statistically significant, but had a relatively low p-value (0.05 < p-value < 0.2) and are probably correlated with malnutrition were:* 100% of mothers of PD children compared to 91% of mothers of malnourished children gave their children snacks (p=0.17). 11% of mothers of PD children fed children food separate from the rest of the family, compared to 0% of mothers of malnourished children (p=0.13). 32% of mothers of PD children ate more during pregnancy compared to 14% of mothers of malnourished children (p=0.19). The average food diversity score for PD children was 194.6 and the average for malnourished children was 165.3 (p=0.15).

4. *Foods Consumed by the Mother during pregnancy and breastfeeding*

- Mother's consumption of β-carotene foods during breastfeeding
- Mother's consumption of retinol-rich foods during breastfeeding
- Mother's consumption of B6-rich foods during breastfeeding
- Mother's consumption of zinc-rich foods during breastfeeding
- Mother's consumption of protein-rich foods during breastfeeding
- Regularly adding fat to mother's meals during breastfeeding

In Bolivia, 99% of mothers of PD children compared to 92% of mothers of malnourished children usually consumed beta-carotene rich foods while breastfeeding (p=0.02). The odds ratio for this variable was 8.35 (0.98<OR<187.56).

In Bolivia, 87% of mothers of PD children compared to 72% of mothers of malnourished children usually consumed retinol rich foods while breastfeeding (p=0.01). The odds ratio for this variable was 2.69 (1.17<OR<6.28). ***In Burundi***, 100% of mothers of PD children said that they consumed retinol-rich foods while they were breastfeeding compared to 85% of mothers of malnourished children (p=0.009). The odds ratio for this variable was 0.0 (0.0 < OR < 0.82). **Mothers of PD children are more likely to consume foods high in retinol – such as organ meats (liver, kidney, etc.) – while they were/are breastfeeding.**

In Bolivia, 71% of mothers of PD children compared to 54% of mothers of malnourished children usually consumed B6 rich foods while breastfeeding (p=0.017). The odds ratio for this variable was 2.10 (1.08<OR<4.12). ***In Burundi***, 47% of mothers of PD children vs. 23% of mothers of malnourished children reported that they consumed vitamin B6-rich foods while they were breastfeeding (p=0.02). The odds ratio for this variable is 0.34 (0.12 < OR < 0.93) which means that **mothers of PD children are three times more likely to consume foods high in B6 – such as liver, garlic and whole grain rice – while they were/are breastfeeding**.

In Burundi, 81% of mothers of PD children said that they consumed zinc-rich foods while they were breastfeeding compared to 63% of mothers of malnourished children (p=0.046). The odds ratio for this variable was 0.38 (0.13 < OR < 1.11) meaning that **mothers of PD children are 2.6 times more likely to consume foods high in zinc –** such as nuts, organ meats, and red meat – while they were/are breastfeeding.

In Burundi, 100% of mothers of PD children vs. 90% of mothers of malnourished children reported that they consumed protein-rich foods while they were breastfeeding (p=0.03). The odds ratio for this variable is 0.0 (0.0 < OR < 1.27). Mothers of PD children are more likely to consume foods high in protein – such as all bean varieties, nuts, fish, meat, and eggs – while they were/are breastfeeding.

5. *Particular Nutrients*

- β-Carotene-rich foods
- B2-rich foods
- Potassium-rich foods
- Magnesium-rich foods

β- Carotene-rich foods: ***In Bolivia***, PD children consumed beta-carotene rich foods an average of 11.6 times in a week vs. 9.3 times for malnourished children (p=0.046). β-Carotene-rich foods available in Bolivia include pumpkin, yellow sweet potato, carrots, greens (kale, spinach, collards, turnip greens), papaya, guinea pig, rabbit, lamb, goat, or llama meat, yellow squash, isano, cantaloupe, red peppers, tomato paste, mango and broccoli.

B2-rich foods: ***In Mozambique***, PD children consumed B2-rich foods on average 11.2 times per week vs. 6.3 times per week for malnourished children. (p=0.0042) PD children consumed B2-rich foods on average 78% more often than malnourished children. B2-rich foods available in Mozambique include organ meats (e.g., liver, kidney), cheese, cocoa, red meats, bran, any fish, soy beans, almonds, and eggs.

Potassium-rich foods: ***In Mozambique***, PD children consumed potassium-rich foods on average 16.7 times per week vs. 11.5 times per week for malnourished children. (p=0.021). PD children consumed potassium-rich foods on average 45% more often than malnourished children. Potassium-rich foods available in Mozambique include tomato paste, molasses, white beans, cowpeas, kidney beans, other beans, lentils, nuts, seeds, pigeon peas, cowpeas, palm hearts, beans.

Magnesium-rich foods: ***In Mozambique***, PD children consumed magnesium-rich foods on average 24.7 times per week vs. 15.5 times per week for malnourished children. (p=0.002). PD children consumed magnesium-rich foods on average 59% more often than malnourished children. Magnesium-rich foods available in Mozambique include greens (kale, spinach, collards, turnip greens), saltwater fish, molasses, beans, peas (e.g., pigeon, cow), lentils, nuts, seeds, whole grains, and maize.

Of these foods, the most commonly consumed by PD children in Mozambique were (in order): maize, whole grains (oats, bulgur, barley, millet), greens, fish, nuts, tomato paste, beans (any), cowpeas, white beans, almonds, eggs, and pigeon peas. **Legumes, nuts, seeds, and peas are foods that contained more than one of these three nutrients**. PD children were also more likely to have consumed foods rich in B12, copper, retinol, iron, phosphorous, and lycopene (but none of these differences were statistically-significant).

In Kenya, *we tested the Hemoglobin of children 12-59 months of age during this PD study and found that 81% of the children were anemic, with 71% of them either moderately or severely anemic. A prevalence above 40% is considered a severe public health problem.*

6. *Child Care Practices*

- Average hours for which the child is away from the mother each day

In Burundi, on average, **mothers of PD children were away from their children longer during the day than mothers of malnourished children**. Mothers of PD children were away from their children an average of 5.7 hours on average most days compared to 4.0 hours on average for mothers of malnourished children ($p<0.0000$). This trend was congruent with another nearly significant variable, the mothers' practice of always taking the child with her when they leave to go outside the home. ***In Kenya***, mothers of malnourished children were away from their child an average of 6.7 hours per day vs. five hours for mother of PD children. ($p=0.027$)

Concerning child care practices, another finding that was not statistically significant because CI included 1.0, but is probably correlated with malnutrition is: **In Burundi**, Only 28% of mothers of PD children said that they always take their child with them when outside the home compared to 48% of mothers of malnourished children who said that they did this ($p=0.05$). The odds ratio for this variable was 2.34 ($0.91 < OR < 6.08$) meaning that **mothers of PD children are two times more likely to not take their child with them when they go outside the home during the day**. This warrants further investigation as it is counter-intuitive. It could be that mothers of PD children who are more likely to be working for cash or gifts in kind are working outside the home and leaving their children at home. Perhaps more mothers of malnourished children are always taking their children with them because they are currently breastfeeding *because* the child is malnourished.

7. *Healthcare Seeking Behavior and Home Management of Sick Children*

- Child ill during the past two weeks
- Child ill with diarrhea during the past two weeks
- Child ill with an illness other than diarrhea, ARI, fever, or malaria during the past two weeks
- Child dewormed in the past six months

In Burundi, 65% of mothers of PD children said that their child was not sick in the past two weeks. 25% of mothers of malnourished children said that their child was not sick

(p=0.0001). The odds ratio for this variable is 0.18 (0.06 < OR < 0.48) meaning that **PD children were 5.5 times less likely to have any disease in the past two weeks**.

In Mozambique, 0% of PD children were ill with diarrhea during the past two weeks vs. 29% of malnourished children. (p=0.02) ***In Burundi***, 83% of mothers of PD children vs. 48% of mothers of malnourished children reported that their child was not sick with diarrhea during the previous two weeks (p=0.0004). The odds ratio for this variable is 5.16 (1.81 < OR < 15.14) meaning that **PD children were five times less likely to have diarrhea in the past two weeks**. (An analysis of factors associated with diarrhea in the past two weeks was also done – see **Annex C**.) ***In Bolivia***, 15% of PD children compared to 27% of malnourished children had diarrhea in the past two weeks (p=0.04). The odds ratio for this variable was 0.47 (0.21<OR<1.05).

In Mozambique, 0% of PD children were ill with an illness other than diarrhea, ARI, fever or malaria during the past two weeks vs. 29% of malnourished children. (p=0.02) (Odds ratio was 0.00 [0.00-0.97]. ***In Burundi***, 96% of mothers of PD children said that their child was not sick with other diseases in the past two weeks. 81% of mothers of malnourished children said that their child was not sick with diseases other than diarrhea, ARI, fever or malaria (p=0.029). The odds ratio for this variable is 5.08 (0.92 < OR < 36.89) which means that **PD children are five times less likely to have had some other disease in the past two weeks**.

In Bolivia, 67% of PD children compared to 39% of malnourished children had been dewormed in the past six months (p<0.001). The odds ratio for this variable was 0.32 (0.16<OR<0.62). ***In Ethiopia***, PD children were 2.8 times more likely to be dewormed in the past six months. 52% of PD children and 28% of malnourished children were dewormed in the past six months (p=0.014, OR=0.36, CI: 0.14<OR<0.90).

In Bolivia, 99% of mothers of PD children compared to 92% of mothers of malnourished children regularly use iodized salt in their child's food (p=0.02). The odds ratio for this variable was 0.12 (0.01<OR<1.01).

8. *Mother's (or Caregiver's) World View*

Concerning the mother's worldview, another finding that was not statistically, but had a relatively low p-value (0.05 < p-value < 0.2) and may be correlated with malnutrition is: **In Bolivia**, 25% of mothers of PD children compared to 9.5% of mothers of malnourished children believe that a neighbor can cause a child to lose weight (p=0.16). (Needs more exploration since this is in the opposite of what one might expect.

9. *Mother/Caregiver's Acceptance of (and Responsiveness to) Child*

Statistically-significant differences were found between mothers of PD and malnourished children concerning the mother's acceptance of – and responsiveness to – the child as measured by the following variables:

- Whether or not the child was hit or spanked
- Degree to which the mother says that her child has pleased her in the past month

In Mozambique, PD children were hit or spanked more often than malnourished children. PD children were hit or spanked an average of 1.3 times per week vs. 0.82 times per week for malnourished children (p=0.007). This may be due to the fact that PD children are often more energetic and curious. ***In Burundi***, 78% of mothers of PD children vs. 48% of mothers of malnourished children said that they hit or spank their child (aged 12-48m) zero times in the past week (p=0.002). The odds ratio for this variable is 3.91 (1.45 < OR < 10.79) meaning that **malnourished children were four times more likely to have been hit or spanked in the past week**. Spanking or hitting these young children could affect the bond between the mother and child and the child's eating behavior, or it could be that malnourished children – being more anorexic and irritable – may incur their parent's wrath more often. ***In Kenya***, 40% of mother of PD children claimed to have hit or spank their children in the past week (at least once) vs. 72% of mothers of malnourished children. ***Mothers of malnourished children were somewhere between 33% and 11 times more likely to have hit or spanked their child in the past week***. (OR=3.83; CI=1.33 – 11.21; p=0.005. ***In Ethiopia***, PD children were hit or spanked an average of 1.6 days in the past week, whereas malnourished children were hit or spanked an average of 0.80 days (p=0.04)

In Bolivia, 91% of mothers of PD children compared to 79% of mothers of malnourished children report that their child has pleased them in the past month (p=0.018). The odds ratio for this variable was 0.35 (0.13<OR<0.93).

10. *Mother/Caregiver's Support Network*

Statistically-significant (and in some cases counter-intuitive) differences were found between mothers of PD and malnourished children concerning the mother's support network as measured by the following variables:

- Average social support score of mother (scale does not include caring for a family member with a chronic illness)
- How often the mother of the child visits or talks with other friends or family outside of the household
- Whether or not the mother says that anyone in the household has been very sick or bedridden for a period of more than three months

Average social support score of mother (scale does include caring for a family member with a chronic illness): ***In Mozambique***, mothers of PD children had an average social support score of 4.6 vs. an average score of 6.0 for mothers of malnourished children. [p=0.12] Mothers of malnourished children had a significantly better system of social support measured by this scale. This social support score included caring for a family member with a chronic illness. This is counter-intuitive and should be further explored. Participation in some program for mothers of malnourished children (e.g., Hearth) may be the difference here.

In Burundi, **mothers of malnourished children were 3.6 times more likely to often visit friends or family members outside the household**. Only 54% of mothers of PD children said that they often visit or talk with a friend or family member outside of their household vs. 81% of mothers of malnourished children who said that they did this

(p=0.005). "Often" is defined as several times a day or week. The odds ratio for this variable was 3.64 (1.30 < OR < 10.37). This seems counter-intuitive and warrants further investigation. It could be that mothers of malnourished children are visiting friends and family members so often that they are ignoring the needs of their children. Or perhaps the mothers of malnourished children are seeking out support to get help for their child. Another possible connection is that when mothers visit friends and family members so often, their children are exposed to many different pathogens, increasing their chance of illness and subsequently, becoming malnourished.

In Mozambique, 55% of the mothers of the PD children said that <u>there was at least one person in their household who had either been very sick or bedridden</u> (including anybody who has since died) vs. only 13% of mothers of malnourished children. (p=0.002) The odds ratio for this variable was 7.94 (1.71<OR<41.38). Of those who were chronically bedridden or had died, 67% were in their productive years (15-49). This is also counter-intuitive. It may be that there are extraordinary family systems (or government programs) that come into play when a family has a member who is chronically ill (or that dies).

Concerning a mother's support network, another finding that was not statistically significant, but had a relatively low p-value (0.05 < p-value < 0.2) and is probably correlated with malnutrition was: **In Bolivia,** 72.2% of mothers of PD children compared to 43.0% of mothers of malnourished children have family who live close by that they can stay with (p=0.065). (a proxy for social network quality)

11. *Mother/Caregiver's Relationship with Husband/Partner*

No statistically-significant differences were found between mothers of PD and malnourished children concerning the mother or caregiver's relationship with her husband/partner. *However, there was a non-statistically significant result with a relatively low p-value (0.05 < p-value < 0.2) which may be correlated with malnutrition:* **In Bolivia,** 33% of mothers of PD children compared to 60% of mothers of malnourished children were satisfied with their relationship with their husband (p=0.10). (Needs more study –opposite of what one might expect.)

12. *Mother/caregiver's Self-report of Symptoms of Depression*

No statistically-significant differences were found between mothers of PD and malnourished children concerning the mother or caregiver's self-report of symptoms of depression. *However, there was a non-statistically significant with a relatively low p-value (0.05 < p-value < 0.2) which may be correlated with malnutrition:* **In Bolivia,** 35% of mothers of PD children compared to 58% of mothers of malnourished children reported being depressed half of the week (p=0.17).

13. *Hygiene Practices*

Statistically-significant differences were found between mothers of PD and malnourished children concerning the mother's hygiene practices as measured by the following variables:

- Hygiene index of mother's or caregiver's practices
- Whether or not the child defecated in a proper place the last time s/he did so
- Number of practices mother or caregiver mentions concerning safe food handling and preservation

- Treatment of child's drinking water

A hygiene index was developed that examined mothers' hygiene practices. (0 is lowest possible and 7 is highest possible.) ***In Bolivia***, mothers of PD children have an average hygiene practices index score of 3.3 vs. 2.7 for mothers of malnourished children (p=0.02). ***In Ethiopia***, mothers of PD children have an average hygiene practices index score of 2.61 vs. 2.06 for mothers of malnourished children (p=0.03).

In Burundi, Mothers were asked an open-ended question concerning where the child last defecated, and then a response category was ticked based on her response (without prompting). 57% of mothers of PD children indicated that their child defecated in a proper spot the last time they defecated. 23% of mothers of malnourished children said that their child did this (p=0.0008). The odds ratio for this variable is 0.23 (0.08 < OR < 0.61) meaning that **mothers of PD children were four times more likely to have a child who defecated in a proper spot at last defecation.** ***In Kenya***, 52% of the mothers of PD children names a proper area for where her child defecated vs. 28% of malnourished children (p=0.04). ***In Ethiopia***, 35% of PD children compared to 8% of malnourished children defecated in a proper spot (p=0.001, OR=0.17, CI: 0.04<OR<0.60).

In Bolivia, mothers of PD children mention an average of 5.2 safe food handling practices vs. 4.2 for mothers of malnourished children (p=0.01).

In Mozambique, 67% of mothers of PD children said that their child's drinking water was treated (by boiling, chlorination, filtration, or solar) vs. 36% of mothers of malnourished children. [p=0.029]. The odds ratio for this variable was 3.64 (0.99<OR<13.9). This means that children whose mothers said that their drinking water was purified were 3.6 times more likely to be PDs. Purification methods included boiling [30% of all participants], adding bleach/chlorine [17%], filtration [4%], and solar disinfection [2%]. When another simple, but not necessarily effective methods is added (sieving through a cloth), the odds ratio increases to 5.5 (p=0.006).

14. *Specific Foods Consumed by the Child*

Statistically-significant differences were seen in the consumption of the following foods by PD and malnourished children in Mozambique:

a. **Maize** (p=0.000002; PD avg = 5.1 times consumed per week; Mal avg = 1.6 times consumed per week): Eaten 3.8 times more often by PD children.
b. **Whole grains** (p=0.0002; PD avg = 4.2; Mal avg = 1.36): Eaten more than three times as often by PD children.
c. **Broccoli / Cabbage** (p=0.002; PD avg = consumed 2.65 days per week; Mal avg = consumed 0.879 days per week): Eaten three times as often by PD children.
d. **Fish (any type)** (p=0.0021; PD avg = 2.8; Mal avg = 1.39): Eaten two times more often by PD children.
e. **Beans** (p=0.013; PD avg = 2.105; Mal avg = 0.879): Eaten 2.4 times more often by PD children.
f. **Cassava** (p=0.02; PD avg = 2.9; Mal avg = 1.485): Eaten almost twice as often by PD children.

g. **Pumpkin** (p=0.0229; PD avg = 1.35; Mal avg = 0.788): Eaten 1.7 times more often by PD children.

Two other specific foods were *close to* the cut-off for being significantly related to PD in Mozambique:

- **Tomatoes** just missed the p<0.05 level of significance (p=0.052; PD avg = 4.737; Mal avg = 3.121)
- **Eggs** just missed the p<0.05 level of significance, as well (p=0.069; PD avg = 1.368; Mal avg = 0.645)

There were also a few specific foods that were eaten *much more frequently* by PD children in Mozambique (>5 times more often). The differences in average consumption frequencies for these foods for PD and malnourished children were *not statistically significant*. All of these foods were consumed by PD children less than once a week:

- **Kidney** (eaten 10 times more often by PD children [ns])
- **Cocoa** (eaten 8.8 times more often by PD children [ns])
- **Tuna** (eaten 7.4 times more often by PD children [ns])
- **Molasses** (eaten 7.1 times more often by PD children [ns])
- **Beets** (eaten 6.0 times more often by PD children [ns])
- **Soy beans** (eaten 5.9 times more often by PD children [ns])

In Burundi, statistically-significant and nearly significant differences were seen between mothers of PD and malnourished children concerning the child's consumption of the following foods:

- Salt
- Taro
- Organ Meats

***In Burundi,* Mothers of PD children are seven times more likely to have <u>given their child salt</u> in the past 24 hours**. A full 98% of mothers of PD children included salt in their food vs. 86% of mothers of malnourished children (p=0.04). The odds ratio for this variable is 0.14 (0.02 < OR < 1.16). This connection to nutritional status could be due to the effect of iodine (since most mothers who used salt claimed to be using a brand that was iodized) or simply due to increased consumption of food by the child because the added salt improves the food's flavor.

***In Burundi,* Mothers of PD children are four times more likely to have <u>given their child taro</u>** (a root crop) in the previous 24 hours. 37% of mothers of PD children fed their child taro compared with 12% of mothers of malnourished children (p=0.004). The odds ratio for this variable is 0.23 (0.08 < OR < 0.66). Taro is high in the micronutrients **manganese, potassium, Vitamin E and B6** which are associated with growth and cellular integrity. (It also contains phytate, which binds some micronutrients and limits their bioavailability.)

***In Burundi,* Mothers of PD children <u>give their children organ meats</u> 2.6 times more often per week** compared with mothers of malnourished children (p=0.04). PD children ate organ meats an average of 0.39 times per week while malnourished children ate them an average of 0.15 times per week. Organ meats, such as liver, kidney, heart,

giblets, and gizzards are a good source of nutrients such as **retinol, zinc**, and **vitamins B6** and **B12** which are associated with growth and metabolism.

Statistically-significant differences were seen in the consumption of the following foods by PD and malnourished children in <u>Kenya</u>:

a. ***Sukuma* (kale)** Odds Ratio = 0.17, p-value = 0.003. **Children who ate *Sukuma* the previous day were about six times less likely to be malnourished.**

b. **Milk** OR = 0.27, p=0.009. **Children who consumed milk the previous day were about four times less likely to be malnourished.**

c. **Eggs** OR = 0.07; p=0.003. **Children who consumed eggs the previous day were about 14 times less likely to be malnourished**

In Ethiopia, a statistically-significant difference was seen between mothers of PD and malnourished children concerning the child's consumption of the following food:

- Wheat

  Odds Ratio = 2.58, p-value = 0.03. Thus c**hildren who ate *wheat* the previous day were about 2.6 times more likely to be malnourished.**

III. Implications Based on Results of LDM Study

The findings from these studies are providing Food for the Hungry with more insights into what practices and foods should be promoted in each country context, and what additional interventions should be considered in FH's health and nutrition programs. In the context of the LDM workshop, a facilitated discussion of the results brings together team members and stakeholders to suggest action steps to take and educational messages to apply to the current or planned health and nutrition program. FH headquarters' staff specialists also provide input into the suggested actions and behavior change messages. Some of the LDM results will warrant further investigation, a process which is which is best facilitated by utilizing a focus group setting. The basic educational messages can be supplemented with results from other formative research tools, such as messages targeting specific determinants of the behavior as drawn from a Barrier Analysis study. Ultimately, the actions and messages are incorporated into the program activities, such as Care Group curriculum and radio spots, and program design in order to promote appropriate health and nutrition behavior practices among households.

Findings, Suggested Action and Suggested Health Promotion Messages Based on Results of LDM Study (FH/Mozambique)

Finding	Suggested Action	Suggested Educational Messages
Mothers of PD children were seven times more likely to **completely empty their breasts when breastfeeding**	➢ Explore why PD mothers are more likely to do this. Is it due to child's level of hunger? Learned practice? ➢ Promote message related to this through programs. ➢ Explore mothers' feelings about doing this behavior, confront any barriers to it, and promote any positive aspects of the behavior that they mention	➢ When breastfeeding a child, it is important to always completely empty each breast so that the child gets all of the calories and nutrients that they need. Mothers who do this are seven times less likely to have a malnourished child.
Mothers of PD children were more than four times as likely to **take iron supplements while they were breastfeeding**	➢ Look into government policy concerning iron supplementation of mothers during lactation. Increase supplementation during lactation. ➢ Look into why some mothers do this and others do not. ➢ If this is not an option, consider purchasing iron supplements for this purpose (e.g., through IPA or local sources) with non-U.S. government funds. ➢ Re-examine data to look for dosage effect of iron supplementation on HAZ and WAZ.	➢ All mothers should take iron supplements during pregnancy as a way to help their children grow. ➢ Look up recommendations on iron supplementation during lactation.
Mothers of *malnourished* children are more likely to encourage their non-hungry child to eat	➢ Look into why this is true. Have the mothers in this study participated in a hearth nutritional rehabilitation workshop?	

Finding	Suggested Action	Suggested Educational Messages
The following foods were found to be associated with positive deviance: ➢ **Maize** ➢ **whole grains** ➢ **cabbage** ➢ **fish** ➢ **beans** ➢ **cassava** ➢ **pumpkin**	➢ Look at ways to make these foods more accessible to families. ➢ Encourage the planting of some of these foods in home gardens. ➢ Create hearth meals using these foods. Get costs on each to come up with the least expensive meals. ➢ Look at nutrient content of these foods to identify the nutrients in each (in order to promote those nutrients and to better understand how they may help lower malnutrition).	➢ Maize and whole grains are the best "bases" to use when preparing porridges for young children. Children who eat these foods are less likely to become malnourished. ➢ Fish and beans are good choices for high protein foods to use in meals for young children. Children who eat these foods are less likely to become malnourished. ➢ Pumpkin and cabbage are rich in vitamins and other nutrients and should be included in the meals of young children when possible. Children who eat pumpkin and cabbage are less likely to become malnourished.
0% of PD children were ill with **diarrhea** during the past two weeks vs. 29% of malnourished children	➢ Malnutrition can be both a cause and an effect of diarrhea. FH should continue to focus on both proper dietary management of diarrhea as well as increased efforts to decrease diarrhea incidence and prevalence. ➢ Consider zinc supplementation during diarrheal episodes to shorten prevalence and protect against future episodes. ➢ Increase promotion of water purification methods (in particular), hand washing, and other hygienic practices.	➢ After a child has had diarrhea, feed the child an extra meal a day for a week to help the child regain weight that has been lost. ➢ [Water purification messages – se below.] ➢ [Hygiene messages – see below.]
0% of PD children were ill with **an illness other than diarrhea, ARI, fever or malaria** during the past two weeks vs. 29% of malnourished children	Look back through questionnaires and tabulate which other illnesses were mentioned for this question. See if proper prevention and management messages and interventions are in place for these illnesses.	

Finding	Suggested Action	Suggested Educational Messages
Mothers of PD children had a *lower* social support score (4.6) in comparison with mothers of malnourished children (6.0)	Explore why mothers of malnourished children appear to have a better support system than those of PD children.	
55% of the *mothers of the PD children* said that there was at least one person in their household who had either been **very sick or bedridden** (including anybody who has since died) vs. only 13% of mothers of malnourished children.	Explore why families who have a chronically ill person appear to have *better* nourished children. Knowing this may help when we respond to HIV through our Title II programs. What coping mechanisms are in place?	
Children whose mothers said that their **drinking water was purified** were 3.6 times more likely to be PDs.	➢ Water treatment methods used were boiling (30%), adding bleach/chlorine (17%), sieving (11%), filtration (4%), and solar purification (2%). ➢ Explore why chlorination is not used routinely. ➢ Heavily promote chlorination of water using bleach.	➢ All water consumed by your family should be treated to prevent diarrhea and other diseases. ➢ To purify water, use four drops of bleach per liter of water.
B2, potassium, and magnesium appear to be associated with positive deviance in this population	➢ Promote frequent consumption by children of foods rich in these nutrients. (Foods rich in these nutrients are listed earlier in this report.) ➢ Promote legumes, nuts, and peas since these are locally available, locally consumed and contain more than one of these three nutrients. Use these extensively in hearth meals and promote in recipes.	➢ Be sure to use legumes, nuts, and peas in the meals you fix for younger children. They help the child to grow well. ➢ (Promote consumption of other foods rich in these three nutrients.)

Findings, Suggested Action and Suggested Health Promotion Messages Based on Results of LDM Study (FH/Burundi)

Finding	Question/Information
1. Mothers of PD children were four times more likely to **give birth to an average, large, or very large baby.**	How large was (NAME) when he/she was born in comparison to other newborn/babies in the community: very small, somewhat smaller than average, average, somewhat larger than average, or very large?
Additional Questions to Consider:	
▪ How is food distributed in the family? ▪ When a woman is pregnant is she given more, less, or the same portions of food as when she is not pregnant? ▪ Are there taboos or restrictions about what pregnant women can eat? ▪ What do people think about having a big baby or a small baby? ▪ Why do some women have large babies and other's small? ▪ Do women usually go to the health center for prenatal consults?	
Suggested Action	**Suggested Educational Messages**
▪ Supervisors and Promoters coordinate with the MOH to determine: 1. if iron tablets are available at the local health facility and what the recommendation dose and duration is for pregnant and lactating women, 2. determine if the supply of iron tablets is sufficient to respond to local need. 3. if the MOH would be interested or open to using the Care Group network to ensure pregnant and lactating women are able to obtain a consistent supply of iron tablets.	▪ Geophagy* (eating dirt) or Pica (the eating of inappropriate objects and material) cravings indicate a person's physiological need for micronutrients. (*Geophagy, the regular and deliberate consumption of soil, is prevalent among pregnant women in sub-Saharan Africa. The clay commonly ingested in Africa contains important nutrients such as: phosphorus, potassium, magnesium, copper, zinc, manganese, and iron.) http://www.ajtmh.org/cgi/content/abstract/80/1/36, http://geography.about.com/cs/culturalgeography/a/geophagy.html
▪ If the supply of iron tablets is insufficient or inconsistent, FH supervisors can ask permission of the local MOH to coordinate with the national MOH and external donors to increase and improve supply.	▪ Help women who eat dirt to connect that craving with their need to go for prenatal visits, take iron supplements, and eat a diverse, colorful diet that can provide the micronutrients (phosphorus, potassium, magnesium, copper, zinc, manganese, and iron) that pregnant and lactating women need.
▪ Recipe demonstrations or contests teaching women how to prepare iron rich foods for pregnant women (especially using organ meats).	▪ Importance of Prenatal consults to ensuring the healthy growth of infants while in the womb.
▪ Investigate negative feelings women have about having a "big" baby through focus groups.	▪ Importance of a diverse diet – include all 3 food groups at each meal.
▪ Diffuse untrue beliefs and taboos about the consequences of eating certain foods during pregnancy using radio spots. (Examples: Liver is a taboo food for pregnant women because they believe the child will not have teeth if they eat liver. There are also people who don't allow their women or children to eat liver, because they say it will cause them to lose their teeth. Some women believe that if pregnant women consume lots of milk and avocado they will have babies that are too big.)	▪ Pregnant women need to eat more often than usual and more food than usual. Families can help by allowing women to determine the portion size she needs.
▪ Help women plan for alternative, economical foods to consume when normal foods (beans, oil, etc.) are not appetizing during Care Group discussions.	▪ Pregnant women need to eat more foods rich in protein. Families can help by allocating money and resources to make sure foods like meat, chicken, fish, and eggs are available for the pregnant woman to prepare. ▪ A pregnant woman sometimes doesn't want to eat what she normally eat (like beans) because it is unappetizing and makes her feel sick. Families should ensure that there are nutritious replacements that the woman can eat so that she doesn't lack food. ▪ Pregnant women need extra rest, they should plan their schedules to sleep for 8 hours a night and take naps if needed.
Finding	**Question/Information**
2. Mothers of PD children were more likely to **consume foods high in retinol while breastfeeding**. (Foods such as liver, kidney, and other organ meats.)	When you were (or while you are) breastfeeding (NAME), did you usually eat (or do you usually eat) any of the following foods?
Additional Questions to Consider:	
▪ Are their certain foods breastfeeding women are encouraged to eat? ▪ Do people generally believe there is a connection between what a breastfeeding woman eats and what is in the breastmilk? ▪ How should a special diet for breastfeeding women be promoted?	
Suggested Action	**Suggested Educational Messages**
▪ Teach mothers the value of eating organ meats rich in retinol in addition to other special foods rich in retinol, such as margarine, butter, canned fish, and cheese, during Care Group discussions.	▪ What BF women consume affects the quality of their milk. Eating organ meats, such as liver and kidney, will make a breastfeeding mother's milk better. (i.e. will increase quantity of retinol in milk)

Finding	Question / Information
3. Mothers of PD children are three times more likely to **consume foods high in pyridoxine (B6) while breastfeeding**. (foods such as liver, garlic, and whole grain rice)	Same question as above.
Suggested Action	**Suggested Educational Messages**
▪ Cankuzo produces a lot of rice and a kilo of rice is about four times the cost of taro, so the people will sell the rice and buy four times the taro. Promote saving some of the rice that is cultivated so the BF mothers can eat it in Care Group discussions. ▪ Liver is very expensive, even in the city it is very expensive – not many people can buy this. It could be promoted as a "special" food in Care Group curriculum. ▪ Many do not know the nutritional value of garlic, so we should promote it in Care Group discussions. Garlic is available in Burundi, even cultivated and sold. It is mostly available in Muslim populations and consumed by them on a daily basis. ▪ Women cultivate their fields and men sell the harvest to pay his bills, so there is no money to pay for these types of expensive but nutritious foods. Investigate how can women gain more power over the food they grow and the money it makes through focus groups.	▪ What BF women consume affects the quality of their milk. This may mean eating special foods every once in awhile (liver, rice, etc) to help your baby grow strong from your milk. ▪ Did you know garlic is more than a spice? Use some everyday to season your food and make your milk better. ▪ Rice is worth more than the money you can sell it for. Eating rice will make your milk better and your baby stronger. ▪ Taro is a great food for children when they start to eat solid foods, but rice is better for the breastfeeding mother (i.e. consuming rice increases the quantity of pyridoxine in her body). Make sure you save some rice for yourself and give the taro to your child.
Finding	**Question / Information**
4. Mothers of PD children are 2.6 times more likely to **consume foods high in zinc while breastfeeding**. (foods such as nuts, seeds, organ meats, and red meat)	Same question as above.
Suggested Action	**Suggested Educational Messages**
▪ Teach women how to roast and salt squash and pumpkin seeds (high in Zinc) during Care Group meeting. Could be a great snack to take with them while working!	▪ Did you know that the seeds left over from pumpkins and squash can make a tasty, low cost snack and be good for breastfeeding mothers? Learn how to prepare them at your next Care Group meeting. ▪ What BF women consume affects the quality of their milk. Eating peanuts makes your milk better (i.e. increase levels of zinc) and will help your baby grow strong from your milk. Peanuts can be eaten in many different forms – roasted, ground into flour, or ground into paste. See how many creative ways you can find to enjoy peanuts. ▪ What BF women consume affects the quality of their milk. This may mean eating special foods every once in awhile (organ meats, red meats) to help your baby grow strong from your milk.
Finding	**Question / Information**
5. Mothers of PD children are more likely to **consume foods high in protein while breastfeeding**. (foods such as beans, nuts, fish, meat, and eggs)	Same question as above.
Suggested Action	**Suggested Educational Messages**
▪ Help women plan for high protein foods to consume during Care Group discussions. ▪ Correct misunderstandings in families via radio spots of the type and quantity of foods breastfeeding mothers need to make good milk for the baby and keep her strong. ▪ During Care Group discussions, teach mothers that breastmilk is good even when a mother lacks certain nutrients, but it is even better quality when the mother eats a better diet. A good maternal diet also helps the mother.	▪ Is your wife breastfeeding? Now she needs to eat more meat than usual. Plan to buy meat, fish, peanuts and eggs more often than usual to help your wife make good milk for your baby.
Finding	**Question / Information**
6. Counter-intuitively, mothers of **PD children were away from their children longer during the day** (5.7 hours) in comparison to mothers	For how many hours of the day are you usually away from (NAME) most days?
Additional Questions to Consider:	
▪ Who cares for children when their mother is working? ▪ What instructions are normally given to people caring for children when the mother is away? ▪ Is it normal for women to leave their children when they are away? ▪ Why would children be better nourished when away from their mothers for longer periods of time?	

Suggested Action	Suggested Educational Messages
Not clear what action should be taken based on this finding. ***This should be explored using qualitative methods.*** In a focus group setting, use the "additional questions to consider" to investigate the context of a mother leaving her child in the care of another. What are these substitute caregivers doing to keep the child well nourished? ▪ Normally during harvest times they take the breastfeeding child to the field and leave the child under a tree. But if she leaves the child in the home, usually a grandmother or older child takes care of it. If it is an older woman, it's possible that they are feeding the child better than the mother does, or at least differently. Children who are 2 – 2.5 years are usually weaned and left in the home.	▪ Educational messages can be based on focus group findings.
Finding	**Question / Information**
7. **Counter-intuitively, mothers of PD children are two times more likely to leave their children during the day when they go**	How often do you take (NAME) with you when you go outside the home to cultivate your fields or go to market?
Additional Questions to Consider:	
▪ What happens to children when they are taken to work with their mothers? (Are they exposed to illnesses, not fed, left in the sun/cold/rain?) ▪ If it's not an option to leave a child at home what advice should be given to mothers about caring for their child at work?	
Suggested Action	**Suggested Educational Messages**
▪ Not clear what action should be taken based on this finding. ▪ In a focus group setting, use the "additional questions to consider" to investigate the context of a mother leaving her child in the care of another. Explore how the child is cared for when left at home, and by whom, and how they are cared for when they are taken out with the mother.	▪ Educational messages can be based on focus group findings.
Finding	**Question / Information**
8. **Counter-intuitively, mothers of *malnourished* children were 3.6 times more likely to visit or talk to friends or family members outside the household on a frequent basis** (frequent= several times a day or several times a week)	How often do you usually visit or talk with a friend or family member who lives outside of your household?
Additional Questions to Consider:	
▪ Why would children be more malnourished if their caregiver is more social? ▪ Are children exposed to more illness from other children? ▪ What normally happens when a woman visits a friend or family member with her child? Is the child offered food? Does the child play with other ▪ Is poor advice offered?	
Suggested Action	**Suggested Educational Messages**
▪ Not clear what action should be taken based on this finding. ▪ Participants who responded associated visiting as a negative activity - one of lazy people who don't want to work. They felt that lazy women go visit and beg around when visiting. In a focus group setting, use the "additional questions to consider" to investigate the context of a mother visiting friends and family often. Explore what motivates women to visit others and the assumption that women who visit often are lazy. What are other characteristics of "lazy" mothers?	▪ Educational messages can be based on focus group findings.
Finding	**Question / Information**
9. Mothers of PD children are more than twice as likely to be **working for cash or gifts in kind**.	In the last 12 months, have you done any work for which you got paid in cash or in kind? Yes or No
Additional Questions to Consider:	
▪ If a mother is working does this mean that the child will be better fed? *In general it's true, because it is an additional resource. Apart from the* ▪ Do mothers have control over the money they earn and can spend it care for their children? *Depends on the agreement between husband and* ▪ Do mothers have less control over money made by the husband? *In general, almost everywhere, very few women have a say as to how the* ▪ Is it considered good for a woman to earn cash or gifts in kind or is she expected to be staying at home caring for the house? *It is good that the* ▪ Would it be a positive thing to recommend that more women work for cash or gifts in kind? *As above, thinking of the proverbs: two are better* ▪ *When both husband and wife are working, then the resources are sufficient. If both can find a place to work then there is additional support for*	
Suggested Action	**Suggested Educational Messages**
▪ Find ways to link Care Group members to cooperatives or other business opportunities. Encourage Leader Mothers and beneficiary mothers to join "silk" groups (CRS savings groups). ▪ Put pictures in Care Group curriculum flip-charts that show women working to model this norm.	▪ If possible, women should work for cash or gifts in kind.

Finding	Question / Information
10. Mothers of PD children were three times more likely to **encourage their non-hungry child to eat.**	What do you do when (NAME) does not want to eat or refuses to eat? The mother/caregiver encourage the child to eat (may include positive verbal cues, encouraging behavior, offering another food, or offering an incentive).
Additional Questions to Consider:	
▪ What do mothers do to encourage their children to eat? ▪ What are common threats mothers use to get their children to eat? Are these helpful? ▪ *Use games and songs, plays with the child.* ▪ *Frighten the child with a name of an animal, others beat the child, and say if they don't eat they will give the food away* ▪ *Many said you have to beat or threaten your children to eat or they just won't eat.* ▪ *Sometimes the children will not eat because the food is not to his/her liking.* ▪ *DR. D and Laban responded to the Promoters saying children need to be threatened and beaten by saying that doctors recommend (and research*	
Suggested Action	**Suggested Educational Messages**
▪ Use radio spots to transmit positive parenting messages, especially related to child feeding.	▪ Praising, speaking pleasantly and respectfully to your child, and showing him or her consistent love will make a child feel secure and happy and is the best way to change a child's behavior. ▪ All parents want their children to grow strong and healthy. Sometimes we just don't know how to get our children to do what is best for them. If your child refuses to eat, pretend that you are that child and think about what would encourage you to eat. Would scare tactics or threats motivate you, or would you rather be motivated by kind words and belief that you can do it?
Finding	**Question / Information**
11. The following foods were found to be associated with positive deviance: ➢ **Salt** ➢ **Taro** ➢ **Organ Meats**	▪ Salt & Taro Question: What did you feed to (NAME) yesterday during the day and night? Tell me everything that (NAME) ate and drank yesterday from the time he woke up in the morning yesterday until the time he work up in the morning today. ▪ Organ Meats Question: I want to ask you about all the foods (NAME) has eaten in the past week. I will read the name of a food, and I would like you to tell me how many days during this past week (NAME) ate that food. If he/she ate the food everyday, the answer would be 7 days.
Additional Questions to Consider:	
▪ Why do some mother's use salt to prepare their children's food and others not? *Some mothers add salt because they know the importance of* ▪ Why do you think salt would prevent malnutrition? *Salt constitutes one of the essential nutrients in the balanced diet.* ▪ Is the un-iodized salt from Tanzania commonly used in villages*? It is commonly used in the villages because the project communities are on the* ▪ Is it common for children to be given taro or organ meats to eat? *Yes* ▪ How can these foods be promoted? *Educate the population to grow taro and be involved in small animal raising (chicken), and to give children*	
Suggested Action	**Suggested Educational Messages**
▪ Include salt as an ingredient in recipes for small children promoted in Care Group curriculum, so women remember to put it in. ▪ Show pictures in the Care Group flipcharts of people using iodized salt and crossing out a picture of the non-iodized salt from Tanzania. ▪ Include taro and organ meats from small animals commonly consumed in Burundi in recipes. ▪ Investigate how mothers prepare taro for their children to eat through focus groups in order to gather ideas for recipe development.	▪ Children should be fed salt, taro, and organ meats. ▪ A good meal for children is taro mixed with beans or the small dried fish. ▪ Salt makes food tastes better. Add a little bit of iodized salt to your child's porridge to make it taste better. ▪ What children consume affects the quality of their growth. Taro and organ meats are good foods for children to eat. ▪ Taro is a good food for children but not served all by itself. Mothers can prepare meals with taro using recipes that they learn through Care Group meetings.
Finding	**Question / Information**
12. *Malnourished* children were four times more likely to have been **hit or spanked** in the past week.	Sometimes children behave pretty well and sometimes they do not. On how many days, if any, have you or another member of your household had to hit or spank your child in the past week? (0 vs. #)
Additional Questions to Consider:	
▪ What are the norms regarding child discipline? *They didn't understand the word discipline.* ▪ Do some parents abuse their children, spanking and hitting in excess? *Yes, spanking, beating excessively happens and this traumatizes the child.* ▪ Do some parents not practice enough child discipline and let their children misbehave? *Yes, they let them misbehave and this has negative* ▪ Do parents not pay enough attention to their children to discipline them? *Yes* ▪ Are malnourished children so sick they do not need spankings as compared to health children? *If a child does not eat properly it is not allowed*	

Suggested Action	Suggested Educational Messages
▪ Good to include some teaching about appropriate child discipline in flipcharts. ▪ In a focus group setting, investigate the topic of how parents get their children to do what they want them to do. What are the societal norms for how parents should interact with children? Are these effective at getting children to behave? What expectations do mothers have about their child's behavior? ▪ In a Care Group discussion about child feeding, explore what works and what doesn't work to get children to respond as mothers want them to.	▪ Use messages from how to encourage a non-hungry child to eat (above). ▪ All parents want their children to behave and contribute to society. Sometimes we just don't know how to get our children to do what we want them to do. If your child refuses to behave, pretend that you are that child and think about what would encourage you to act right. Would threats or being hit make you want to behave or would you rather be motivated by firm words and explained limits?
Finding	**Question / Information**
13. PD mothers were 4 times more likely to have a child who **defecated in a proper spot** at last defecation.	The last time (NAME) passed stool, where did he/she defecate? Used sanitation facility, Used a potty (indoor pot or pan), Used washable
Additional Questions to Consider:	
▪ What are common practices regarding child defecation? *In the rural household, the child defecates anywhere, because they don't have pots and* ▪ Does this change when children are taken to the market? *It's the same thing. If a child is on a woman's back and he has to defecate, she just* ▪ To neighbors homes*? (Same thing.)* ▪ Do people understand that child feces can carry disease and need to be properly disposed of? *"They know it causes diseases, but in ignorance*	
Suggested Action	**Suggested Educational Messages**
▪ In the Care Group module about diarrhea prevention and hygiene, include feces mapping (used in CLTS) to help people understand how much filth is around them and how each person has to do their part to clean up the community. ▪ Include teaching that emphasizes the severity of diarrhea and the behavior that causes diarrhea (not burying feces). ▪ In a Care Group meeting discuss how to practically keep your child from defecating just anywhere at home, at the market, when visiting, etc....	▪ The importance of burying or properly disposing of child feces to prevent the spread of disease. ▪ It matters where your child defecates. When your child's feces are on the open ground, they contaminate and make sick anything that comes in contact with it. ▪ Keep <name of community> clean. Dispose of your child's feces in <name of a promoted proper place>.
Finding	**Question / Information**
14. Mothers of *malnourished* children are four and a half times more likely to be currently breastfeeding compared to mothers of PD children	
Additional Questions to Consider:	
Since this study was done with children up to 5 years of age, it indicates that many mothers are continuing to breastfeed their children beyond 2 ▪ What is the normal weaning age? *24 months*. ▪ Do mothers continue breastfeeding because they realize the food they have for their children is not sufficient? *To some degree. Some mothers* ▪ What are normal weaning practices? *Exclusive BF until 4 months and then start supplementing*.	
Suggested Action	**Suggested Educational Messages**
▪ Include suggested educational messages in flipchart teaching. ▪ Use radio spots to communicate the Exclusive Breastfeeding until 6 months message to mothers, fathers, and community leaders.	▪ Make sure women understand that exclusive breastfeeding protects against pregnancy the most, and other breastfeeding (i.e.anything besides of exclusive) helps a little. ▪ Emphasize how complementary feeding fits into breastfeeding (include timing of introduction and feeding frequency as the child ages) ▪ Emphasize exclusive breastfeeding until 6 months – not 4! ▪ When you baby reaches 12 months, breastfeed after offering the meal or snack. ▪ After two years, a child's primary source of nutrition needs to come from food, not breastmilk. Breastmilk can complement the nutrition a child receives from solid and liquid food.
Finding	**Question / Information**
15. Mothers of PD children were three times more likely to **breastfeed within the first hour after birth**.	At how many hours after the birth of (NAME) did you begin breastfeeding? (counted if said < 2 hours)
Additional Questions to Consider:	
▪ What is normally done with a child after it is born? *If a child is born in a hospital BF is immediate. [Our BA study found that happens about 67%* ▪ Do people believe the yellow, first milk is good for a child? *Some believe it is good and others not, "because of ignorance." For those who believe* ▪ Is it common to give beer to a child to clean out its stomach? *There are mothers who, when the child is born, they give the child beer to avoid* ▪ What beliefs need to be overcome to convince people it is good to have the baby breastfeeding within the first hour after birth?	

Suggested Action	Suggested Educational Messages
▪ Communicate this in key "age appropriate messages" ▪ Have Leader Mother emphasize this in late pregnancy. ▪ Teach traditional birth attendants the importance of immediate breastfeeding and the benefit of the first milk. ▪ Teach the benefits to the mother of immediate breastfeeding (expelling the placenta, tightening of the uterus, stop bleeding, etc) in Care Group curriculum.	▪ State specifically that beer should not be given to infants and the problem with giving beer instead of colostrum. ▪ First milk is the best thing to give your newborn baby to help him/her avoid stomach troubles. ▪ Immediate breastfeeding after birth helps you to feel closer to your baby. It makes the placenta come out faster and bleeding to stop, and give the baby a chance to learn how to breastfeed before he's really hungry. ▪ Immediate breast feeding after birth will stimulate your body to produce all the milk your baby needs in its first days and months of life. ▪ The first, yellow milk is like a vitamin and vaccine and very good for the baby. It protects the newborn baby from disease and makes the baby strong.
Finding	**Question / Information**
16. 35% of PD children were ill with **any disease** in the past two weeks vs. 75% of malnourished children.	Has (NAME) suffered from any illnesses in the past two weeks? Yes or No
Additional Questions to Consider:	
▪ What do people believe makes children sick? *Microbes*. ▪ How do people prevent child sickness? *Practice hygiene*. ▪ When children are sick how are they treated? What foods or care is given to them? *See #17 for more info.*	
Suggested Action	**Suggested Educational Messages**
▪ Through the Care Group curriculum explain how lack of hygiene leads to illness. Explain how hygiene practices and protective practices break the illness cycle.	▪ It's up to you to protect your child from getting sick. Washing hands, sleeping beneath a mosquito net, eating good foods, and drinking clean water all work to protect your child from getting sick. ▪ Illness can cause children to become malnourished. It's important to invest time and money in preventing your child from becoming ill.
Finding	**Question / Information**
17. 17% of PD children were ill with **diarrhea** during the past two weeks vs. 52% malnourished children.	What illnesses did (NAME) have in the past two weeks?
Additional Questions to Consider:	
▪ What do people believe makes children have diarrhea? *Mother's milk or breast disease may cause the child diarrhea, so they may wean early. Or* ▪ How do people prevent diarrhea? *Some mother's give water from cooked rice, mixing of charcoal powder and palm oil. They stop giving child*	
Suggested Action	**Suggested Educational Messages**
▪ Diffuse untrue beliefs and taboos about the causes of diarrhea using radio spots. ▪ Discuss real and supposed causes of diarrhea and real and supposed treatments for diarrhea during Care Group discussions. (References were found regarding the use of charcoal powder to treat diarrhea, but no studies that proved it is effective. There is the danger of overdosing children and causing charcoal poisoning.)	▪ Breast milk cures and prevents diarrhea, it doesn't cause it. What a mother eats can affect her child through the breast milk. It takes an estimated four to six hours between the time a breast feeding mother eats a food and the time it affects her milk. If she can establish any relationship between certain foods that she is eating and reactions from her baby, she can avoid these foods. ▪ Baby teeth do not cause diarrhea. But when a child is teething, they will often put things into their mouths, including their hands, to touch their gums. Mothers need to try to keep dirty things out of a child's hands, especially hands that have not been washed after defecation. ▪ Proper home management of diarrhea (avoid water enemas!) using ORS solutions.
Finding	**Question / Information**
18. 4% of PD children were ill with **an illness other than diarrhea, ARI, fever or malaria** during the past two weeks vs. 19% of malnourished children	
Additional Questions to Consider:	
▪ What are the common childhood diseases other than diarrhea, flu, pneumonia, fever and malaria (according to mothers)? *TB, skin diseases,* ▪ What do people believe makes children have these other illnesses? *Lack of vaccination. Most have vaccination, but when the mother did not go* ▪ How do people prevent these diseases? *Tattooing, going to traditional healers or grandmothers. Others rely on trainings from health center and*	
Suggested Action	**Suggested Educational Messages**
▪ Discuss prevention of conjunctivitis through good handwashing practices in Care Group curriculum. ▪ Emphasize the importance of prenatal visits, explaining that it helps protect the health of the mother and the baby. ▪ Describe the types of illness that vaccinations can prevent during Care Group discussions.	▪ Importance of the timely vaccination of children in order to prevent illness. ▪ How can you prevent your child from getting sick? Through timely vaccination.

Findings, Suggested Action and Suggested Health Promotion Messages Based on Results of LDM Study (FH/Kenya)

Finding	Suggested Action	Suggested Educational Messages
Mothers of *malnourished* children were between 33% and 11 times more likely to hit or spank their child	➢ Explore why mothers of malnourished children are more likely to do this.	➢ Educate mothers on more appropriate discipline actions.
PD children consumed on average 3.4 meals per day whereas malnourished children consumed 2.9 meals per day	➢ Promote messages relating to this throughout the program	➢ Educate mothers on the necessity of 5 meals per day (including snacks) for young children
Children who ate **kale** (Sukuma) the previous day were about six times less likely to be malnourished. Children who consumed **milk** the previous day were about four times less likely to be malnourished. Children who consumed **eggs** the previous day were about 14 times less likely to be malnourished.	➢ Promote the consumption of these three foods in project communities. Develop and promote recipes using these three foods. Promote better production of these products in future Title II programs.	➢ Feeding your children more kale, eggs, and milk will help him or her to grow more rapidly.
Mothers of malnourished children were away from their child an average of 6.7 hours per day vs. five hours for mother of PD children	➢ Investigate barriers to spending more time with children ➢ Training workshop on this ➢ Educate mothers on choice of food (local foods) that can be prepared in advance and used as main meals and **snacks** that meet nutritional needs.	➢ Importance of maximizing mother's face-to-face time with young children during early development ➢ Good feeding practices and child care (taught to older siblings and other care givers). ➢ Importance of mother leaving food and detailed instructions on how and when to feed the child with care providers. Choosing reliable alternate care providers.

Finding	Suggested Action	Suggested Educational Messages
Mother of malnourished children were somewhere between 33% and 11 times more like to have hit or spanked their child in the past week	➢ Workshop on problem cause by hitting/spanking young children ➢ Explore when and why children are hit/spanked ➢ Spiritual basis of alternate discipline	➢ Alternate forms of discipline
52% of mothers of PD children named a proper area for where their child defecated vs. 28% of malnourished children	➢ FH should continue to focus on proper hygiene techniques	➢ Continue hygiene messages ➢ Focus on "cat method" – digging a hole in the ground to dispose of waste (if latrine not available) ➢ Worm infestation to children from this ➢ Contamination of food → flies → diarrhea/ vomiting ➢ Contamination of water pans → diarrhea ➢ Spiritual basis for this (Deut 23:13-14)
60% of all mothers believe that malnutrition is either not serious or a little bit serious	➢ Educate mother that malnutrition can be deadly ➢ Teach mother on the establishment of proper nutritional practices like completely emptying breasts during breastfeeding (and other PD behaviors)	➢ Malnutrition can be deadly: accounts for 40-50% of child deaths. ➢ Malnutrition can be prevented by proper <u>nutrition</u> (including breastfeeding and other feeding practices) and <u>sanitation</u> to reduce infections.
The issues below were not found to be significantly related to childhood malnutrition, but FH plans to address these since they affect women's status and other larger development issues:		
96% of the women interviewed said that it was okay for a man to hit a woman	➢ Could work on decreasing through mother's groups / Care Groups and community groups in the future	
39% of the women interviewed were depressed on half of the days of the week or more	➢ In future programs, consider having mothers talk about problems in groups and use interpersonal group therapy techniques. (Refer to WV's work on this in Uganda.) ➢ Could integrate this with mother's groups / Care Groups in the future.	

Finding	Suggested Action	Suggested Educational Messages
81% of the children tested were anemic, with 71% of them either moderately or severely anemic.	➢ Weekly iron supplementation of children. ➢ Daily iron supplementation of pregnant and nursing women. ➢ Demonstration of foods rich in Vitamin A and iron. ➢ Semi-annual deworming of children using mebendazole or albendazole – without fail. Use match money if MOH does not have adequate doses. ➢ Encourage use of insecticide treated nets, and early treatment for malaria when mother or child has a fever. (Follow IMCI protocols.)	➢ Prevention and treatment of malaria ➢ Prevention and treatment of worms (including in pregnant women) ➢ Use iron-rich foods and iron supplements during pregnancy ➢ Pregnant women should stop drinking tea during pregnancy since it inhibits iron absorption. ➢ Pregnant and nursing women should eat iron-rich foods such as organ meats and green leafy vegetables. ➢ Pregnant and nursing mothers should eat iron-rich foods with foods that increase iron absorption – foods with Vitamin C. ➢ Completely empty breasts during BF of child.

Findings, Suggested Action and Suggested Health Promotion Messages Based on Results of LDM Study (FH/Bolivia)

Finding	Suggested Action	Suggested Educational Messages
Mothers of PD children are 14.6 times more likely to have food taboos when lactating	➢ Investigate (e.g., w/FGDs) food taboos in the project areas specific to mothers who are lactating. Explore why mothers of PD children are more likely to have food taboos and what they are feeding their children *instead* of the taboo foods. Use this information to come up with better strategies of improving the diet of lactating women.	➢ If they are nutritious, promote the foods PD mothers are eating in place of taboo foods.
Mothers of PD children are more likely to have food taboos while pregnant (32% of PD compared to 0% of malnourished)	➢ Investigate food taboos in the project areas specific to pregnant women. Explore why mothers of PD children are more likely to have food taboos and what they are feeding their children *instead* of the taboo foods. Use this information to come up with better strategies of improving the diet of lactating women.	➢ If they are nutritious, promote the foods PD mothers are eating in place of taboo foods.
Mothers of PD children feed their children β-Carotene-rich foods three times more frequently than mothers of malnourished children	➢ Review food data to determine which β-Carotene foods are most accessible to mothers.	➢ Promote these foods to mothers in communities.
Mothers of PD children were more likely to give their children snacks (100% of PD vs. 91% of malnourished)	➢ Investigate which snacks given to children. Find ones that are easy to prepare and help diversify the child's diet.	➢ Incorporate with findings that PD children are more likely to have a higher food diversity score by promoting snacks that diversify diet. Teach mothers how to prepare these snacks and when to give them to their child. Emphasize the importance of giving children snacks throughout the day because of their small stomach sizes. Snacks help them to meet their daily nutrient requirements.

Finding	Suggested Action	Suggested Educational Messages
Mothers of PD children are more likely to eat more during pregnancy (OR = 0.36)	➢ Develop program that teaches mothers how much to eat while pregnant. Consider doing Barrier Analysis (http://barrieranalysis.fhi.net) on this behavior.	➢ Teach mothers about proper eating while pregnant
Mothers of PD children are more likely to have a family member who lives close by who can stay with them	➢ Build in mechanisms that promote better social support into future health and nutrition programs (e.g., use of Care Groups, breastfeeding support groups).	
PD children were more likely to have a higher food diversity score	➢ Research snacks given to children. Find ones that diversify diet and promote these. Develop recipes for new snacks that are easy to prepare and nutritious.	➢ Incorporate with findings that PD children are more likely to have a higher food diversity score by promoting snacks that diversify diet. Teach mothers how to prepare these snacks and when to give them to their child. Emphasize the importance of giving children frequent snacks because of their small stomach sizes. Snacks help them to meet their daily nutrient requirements.
The issues below were not found to be significantly related to childhood malnutrition, but FH plans to address these since they affect women's status and other larger development issues:		
Mothers of PD children are 40% less likely to be depressed on half the days of the week or more (as compared with mothers of malnourished children	➢ Build in mechanisms to promote better mental health into future health and nutrition programs (e.g., see World Vision's work with community-level management of depression in Uganda). Include questions and counseling focused on the mother's mental health and coping when assessing families with malnourished children.	➢ Better mental health can lead to healthier children. Mothers should talk to others (including healthcare providers and religious leaders) when they are feeling depressed.

Findings, Suggested Action and Suggested Health Promotion Messages Based on Results of LDM Study (FH/Ethiopia)

Finding	Suggested Action	Suggested Educational Messages
Breastfeeding/Feeding ● Malnourished children are 3.4 times more likely to stop breastfeeding early (<18m). (61% PD vs. 84% Mal) ● PD children consumed on average 3.0 meals per day whereas malnourished children consumed 2.68 meals per day (p=0.02) (*plus giving snacks was almost significant ● Malnourished children are 2.6 times more likely to consume wheat in the previous 24h (PD = 61% vs. Mal = 80%)) (*plus consuming tea (more Mal…iron inhibitor) and onion (more PD…high in sulfur/chromium) was almost significant) ● Malnourished children are 4 times more likely to be currently breastfeeding. (47% PD vs. 78% Mal) Older malnourished children are more likely to be currently breastfeeding. (mean age=33m) <33m 68% PD, 97% Mal >=33m 34% PD, 44% Mal	➢ Encourage continued breastfeeding (until at least 2 years). ➢ Encourage increased frequency of feeding, including the use of snacks. Promote mothers feeding children three meals and two snacks daily. ➢ Food fairs and cooking demonstrations to teach what food types are appropriate for children (consistency and texture) and how to feed children. ➢ Training on income generation activities to improve livelihood of families and access to complementary foods. ➢ Compliment mothers for breastfeeding malnourished children. ➢ Promote certain crops in the local community or fortified food rations to use for complementary foods. ➢ Ask mothers to avoid giving tea to their children, in order to enhance iron absorption. ➢ Raise awareness level of mothers and fathers about appropriate breastfeeding and complementary feeding through health education on proper child nutrition.	➢ Breastmilk should be given to children for at least two years. Breastmilk provides a child who is eating additional calories and protein that they need. ➢ Messages for community members, including fathers and grandmothers, about continuing to breastfeed for at least two years and complementary feeding. ➢ Messages on feeding frequency for children at different ages (in addition to breastfeeds). Include snacks as a way to feed children more often when you are unable to cook. ➢ Nutritional value of important crops and fortified food rations that can be used to produce complementary foods. ➢ Linking health education with social and spiritual activities – for example, eating together at community social events to provide a forum for “change agent” families to influence others to feed their children appropriately.

Finding	Suggested Action	Suggested Educational Messages
Maternal Factors ● Mothers of PD children were 2.9 times more likely to take iron supplements during pregnancy. (39% PD vs. 18% Mal) (*plus average months of iron supplementation during pregnancy was almost significant) ● Mothers of PD children took iron supplements longer during lactation (PD average of 0.7 months vs. Mal average of 0.2 months) (*plus factors related to maternal nutrition during BF were almost significant) ● PD children are 2.9 times more likely to be larger at birth (Average, Large, or Very Large according to mother's assessment) (69% PD vs. 43% Mal)	➢ Increase awareness of mothers about the importance of iron during pregnancy and lactation. ➢ Provide iron supplements. ➢ Iron supplementation campaign for pregnant mothers and promotion of post-partum Vitamin A dosing. Advocacy for iron for lactating mothers. ➢ Promote maternal nutrition and appropriate weight gain during the prenatal period. ➢ Introduce different vegetable crops with high nutrition value. Promote family gardens – use small plot of land, teach appropriate technologies, provide vegetable seeds, teach how to cook vegetables (i.e. support the whole process from growing vegetables to eating them). ➢ Link nutrient supplementation campaign with child immunization campaign.	➢ Pregnant women need to take iron during their entire pregnancy to help their children grow and to avoid maternal anemia. ➢ All women need a dose of vitamin A within 40 days of delivery. Take iron during lactation to help your child grow better. ➢ Women who are pregnant need to eat more food than when they are not. ➢ Blood lost during delivery can be replaced by getting iron supplements or iron containing foods.

Finding	Suggested Action	Suggested Educational Messages
Child Care / Care Seeking ● PD children are 2.8 times more likely to be dewormed. (52% PD vs. 28% Mal) ● PD children are 5.9 times more likely to defecate in a proper spot (diaper or latrine). (35% PD vs. 8% Mal) ● Average hygiene index for mothers (index based on good hygiene habits reported by mother) (PD = 2.61 vs. Mal = 2.06) (*plus average number of essential hygiene practices mothers taught to children almost significant) ● Average number of days child is hit/spanked PD = 1.6 days Mal = 0.80 days (*plus getting hit/spanked was almost significant)	➢ Community mobilization of children 1-5y for deworming during UNICEF's Expanded Outreach posts every 6 months. ➢ Promote wearing shoes and other activities to decrease worm burdens (e.g., fencing out animals from children's play areas). Work on changing attitudes about wearing shoes as a means to improve child's health even before family has economic resources to purchase shoes for children. ➢ Promote home practices of safe stool disposal in latrines and handwashing with ash/soap after handling feces/post defecation and before preparing/eating food and touching utensils. ➢ Encourage every household to have a latrine. Consider barrier analysis on this behavior. ➢ Promote washing diapers in soapy water. Consider pursuing a soap-making initiative using local ash and intercommunity experience sharing. ➢ If water is a problem limiting handwashing, introduce the "tippy tap" to conserve water. ➢ Explore why PD children are more likely to be hit/spanked. Are there other positive child rearing practices (e.g., increased vigilance) confounding this?	➢ "Worms make children malnourished – deworm your children every 6 months." ➢ "Handwashing with soap/ash is important to prevent worm infestation, diarrhea, and transmission of pneumonia." ➢ Dispel myth that child's feces are safe and communicate safe disposal of stool in a latrine. ➢ "Once a child starts to walk, they need shoes to prevent hookworms which suck out a child's blood." ➢ "Every house should have a latrine and use it to help prevent disease transmission and help everyone to be healthy." ➢ "Soap helps remove germs – Wash diapers with soap as well as water."

IX. Conclusions

- The Local Determinants of Malnutrition Study is an innovative, high-quality tool to help project staff assess food security vulnerabilities and predict and mitigate food security risks and shocks in vulnerable populations.

- Use of this tool with relatively small sample sizes can identify useful and heretofore undetected underlying determinants of malnutrition at the local level, which in turn can give a focused direction to program activities addressing food security issues.

- Project field staff can be successfully trained in using this tool and analyzing the results in order to plan better programs or make program changes to better address possible causes of malnutrition in their program areas.

- For questions on the LDM study or use of this tool, please contact:

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Condensed Matrix of Localized Determinants of Malnutrition (Related to Environment/Care)
Sorted by Total Score

Possible Determinant	Strength of Association	Feasibility of Measurement	Susceptibility to Change During Rehab	Susceptibility to Change Outside Rehab	Total Score
1. Family recognition of special nutritional needs of young child	+++++	+++++	+++++	+++++	20
2. Reported hygiene practices	+++++	+++++	+++++	+++++	20
3. Mother's support network	++++	++++	+++++	+++++	18
4. Observed hygiene practices	+++++	++	+++++	+++++	17
5. Promptness of response to child's hunger cues / priority given to child at mealtime	+++	+++	+++++	+++++	16
6. Worldview	+++++	+++++	+++	+++	16
7. Use of preventive health services (e.g. pre-natal care, immunization)	+++	+++++	+++	++++	15
8. Amount of separation of child from mother	+++	+++++	+++	+++	14
9. Child's cry / care seeking behavior	+++	+	+++++	+++++	14
10. Maternal literacy	+++++	+++++	+	+++	14
11. Mother's level of satisfaction with her life in general	++++	++++	+++	+++	14
12. Depression in the mother/caregivers	+++++	+++	+++	+++	14
13. Complication/stress during pregnancy	+++++	+++++	-	+++	13
14. Gender-specific care (i.e., gender of child)	+++++	+++++	-	+++	13
15. Listening to Radio programs on nutrition and child care	+++++	+++++	-	+++	13
16. Promptness in use of modern health services	++++	+++++	-	++++	13
17. Use of Insecticide Treated Bed Nets	+++++	+++++	++++	++++	13
18. Psychosocial stimulation / Mother Child Bonding.	+++++	+++	+	+++	12
19. Happiness w/marriage or partnership	++++	++++	+	+++	12
20. Alcoholism	+++++	++++	-	+++	12
21. Does one or more of child's parents/ caregivers have a chronic illness?	++++	+++++	-	+++	12
22. Provision of financial support for child by father	++++	+++++	-	+++	12

Possible Determinant	Strength of Association	Feasibility of Measurement	Susceptibility to Change During Rehab	Susceptibility to Change Outside Rehab	Total Score
23. Was child wanted?	+++	+++++	-	+++	11
24. Mother's income-generating work / Working outside the home	+++	+++++	-	+++	11
25. Water Source (e.g., type of source, distance to source, use of unprotected water sources)	+++	+++++	-	+++	11
26. Age/maturity of mother	+++	+++++	-	++	10
27. Domestic abuse	+++	++++	-	+++	10
28. Does child live with birth parents	+++	+++++	-	++	10
29. Mother's domestic work load / Number of children mother has to look after	++++	++	-	+++	9
30. Sanitary conditions of child's environment (e.g., where defecation happens, how feces are disposed of)	+++	+++++	-	+	9
31. Sleep problems in child	++	+++++	-	-	7
32. Parent/caregiver's ability to put child's needs first	+	+	-	-	2

Condensed Matrix of Localized Determinants of Malnutrition (Related to Environment/Care)
Sorted by Strength of Association

Possible Determinant	Strength of Association	Feasibility of Measurement	Susceptibility to Change During Rehab	Susceptibility to Change Outside Rehab	Total Score
+++++ Items					
1. Family recognition of special nutritional needs of young child	+++++	+++++	+++++	+++++	20
2. Reported hygiene practices.	+++++	+++++	+++++	+++++	20
3. Observed hygiene practices	+++++	++	+++++	+++++	17
4. Worldview	+++++	+++++	+++	+++	16
5. Maternal literacy	+++++	+++++	+	+++	14
6. Depression in the mother/caregivers	+++++	+++	+++	+++	14
7. Complication/stress during pregnancy	+++++	+++++	-	+++	13
8. Gender-specific care (i.e., gender of child)	+++++	+++++	-	+++	13
9. Listening to Radio programs on nutrition and child care	+++++	+++++	-	+++	13
10. Psychosocial stimulation / Mother Child Bonding.	+++++	+++	+	+++	12
11. Alcoholism	+++++	++++	-	+++	12
++++ Items					
12. Mother's support network	++++	++++	+++++	+++++	18
13. Mother's level of satisfaction with her life in general	++++	++++	+++	+++	14
14. Promptness in use of modern health services	++++	+++++	-	++++	13
15. Happiness w/marriage or partnership	++++	++++	+	+++	12
16. Does one or more of child's parents/ caregivers have a chronic illness?	++++	+++++	-	+++	12
17. Provision of financial support for child by father	++++	+++++	-	+++	12
18. Mother's domestic work load / Number of children mother has to look after	++++	++	-	+++	9
+++ Items					
19. Promptness of response to child's hunger cues / priority given to child at mealtime	+++	+++	+++++	+++++	16

Possible Determinant	Strength of Association	Feasibility of Measurement	Susceptibility to Change During Rehab	Susceptibility to Change Outside Rehab	Total Score
20. Use of preventive health services (e.g. pre-natal care, immunization)	+++	+++++ .	+++	++++	15
21. Amount of separation of child from mother	+++	+++++	+++	+++	14
22. Child's cry / care seeking behavior	+++	+	+++++	+++++	14
23. Was child wanted?	+++	+++++	-	+++	11
24. Mother's income-generating work / Working outside the home	+++	+++++	-	+++	11
25. Water Source (e.g., type of source, distance to source, use of unprotected water sources)	+++	+++++	-	+++	11
26. Age/maturity of mother	+++	+++++	-	++	10
27. Domestic abuse	+++	++++	-	+++	10
28. Does child live with birth parents	+++	+++++	-	++	10
29. Sanitary conditions of child's environment (e.g., where defecation happens, how feces are disposed of)	+++	+++++	-	+	9
++ Items					
30. Sleep problems in child	++	+++++	-	-	7
+ Items					
31. Ability to put child's needs first	+	+	-	-	2
32. Use of insecticide treated bed nets	?	+++++	++++	++++	13

Matrix of Possible Localized Determinants of Malnutrition (Related to Intake / Illness History)

(Sorted by Total Score)

Possible Determinant	Strength of Association[1] / Severity of Problem	Feasibility of Measurement	Susceptibility to Change[2]	Scope of Problem[3]	Total Score
1. Total calorie intake (child)	+++++	+++++	+++++	+++++	20
2. Vitamin A intake (child)	++++	+++++	+++++	+++++	19
3. Age at which supplementary food started	+++	+++++	+++++	+++++	18
4. Protein Intake / Animal protein consumption / Sulfur	+++++	+++++	+++	+++++	18
5. Fat intake (child)	+++++	+++++	+++++	+++?	18
6. Dietary diversity (number of food groups consumed)	+++++	+++++	+++	+++++	18
7. Mother's intake of calories during pregnancy or lactation	+++++	+++	+++++	+++++	18
8. Past history of diarrheal diseases	+++++	+++++	+++	+++++	18
9. History of soil transmitted helminths, parasites, and deworming	++++	++++	+++++	+++++	18
10. Iodine intake (child)	++++	+++++	++++	+++++	18
11. Birth weight	+++++	+++	++++	+++++	17
12. Past history of measles (child)	++++	+++++	+++	+++++	17
13. Past history of respiratory diseases (child)	++++	+++++	+++?	+++++	17
14. Iron intake (child)	++++	+++++	+++	+++++	17
15. Immediate breastfeeding / giving colostrum	+++	+++++	++++	+++++	17
16. Zinc intake (child)	+++++	+++	+++	+++++?	16
17. Exclusive breastfeeding	+++++	+++	+++	+++++	16
18. Complete BF at each feed (i.e., emptying the breasts)	+++++	+++++	++++	++?	16
19. Speed of weaning	+++++	++++	+++++	++?	16
20. Child's diet during illness	++++?	++++	++++	++++	16
21. Vitamin B12 intake (child)	++++	++++	+++	+++++	16
22. Past history of fever / malaria (child)	++++	+++++	++?	+++++	16

[1] In general, we will call an association of 0.1 to 0.3 as +++, and 0.3-0.5 ++++, above 0.5 as +++++. For changes in Z-score, we will call statistically significant associations with more than 0.5 SDs +++++.

[2] Possibility of affecting with an intervention within Title II

[3] Prevalence, geographical distribution

Possible Determinant	Strength of Association[1] / Severity of Problem	Feasibility of Measurement	Susceptibility to Change[2]	Scope of Problem[3]	Total Score
23. Polyphenols: coffee, tea, & cocoa *(iron uptake inhibitors)*	+++?	+++++	+++++	+++?	16
24. Magnesium intake (child)	+++?	+++++	+++++	++??	15
25. Lycopene, flavonoids, & flavonols intake (child)	+++	++++	+++++	+++?	15
26. Number of pregnancies, child spacing	+++	++++	+++	+++++	15
27. Potassium intake (child)	+++?	+++++	+++++	++??	15
28. Maternal B1, B6 & B12 consumption during pregnancy or lactation	+++++	++	+++	++++	14
29. Vitamin A intake during pregnancy and lactation	+++++	++	++++	+++	14
30. Iron intake during pregnancy and lactation	++++	++	+++	+++++	14
31. Maternal consumption of fat during pregnancy and lactation	++++	+	++++	++++	13
32. Phytate to zinc (molar) ratio *&* Phytate / Fiber (child)	+++	++	++++	++++	13
33. Copper intake (child)	++??	++++	++++	+++?	13
34. Mother's intake of protein during pregnancy and lactation	+++?	++	+++	++++	12
35. Phosphorous intake (child)	++??	++++	++++	++??	12
36. Vitamin B2 (Riboflavin) intake (child)	- ?	++++	+++	++++	11
37. Mother's intake of zinc during pregnancy or lactation	++?	++	++	++++	10
38. Calcium intake (child)	+	++++	+++	++??	10
39. Vitamin E (Tocopherol) intake (child)	-	++++	++++	++?	10
40. Age breastfeeding terminated / Length of breastfeeding	-	+++++	+	++++	10
41. Vitamin C intake (child)	-	++++	++++	+?	9
42. Threonine, lysine, & methionine intake (child)	+?	-	++	++++?	8
43. Food taboos for child	+??	++	+++	++??	8
44. Mothers dietary taboos	+??	++	+++	++??	8
45. Exposure to sunlight to generate Vitamin D (child)	-	++	++++	+?	8
46. Maternal illness history	-	+++	+?	++?	6
47. Cooking methods and vitamin preservation	+?	-	+	+?	2

Matrix of Possible Localized Determinants of Malnutrition (Related to Intake / Illness History)

(Sorted by strength of association)

Possible Determinant	Strength of Association[4] / Severity of Problem	Feasibility of Measurement	Susceptibility to Change[5]	Scope of Problem[6]
1. Total calorie intake (child)	+++++	+++++	+++++	+++++
2. Protein intake / Animal protein consumption / Sulfur	+++++	+++++	+++	+++++
3. Zinc intake (child)	+++++	+++	+++	+++++?
4. Fat intake (child)	+++++	+++++	+++++	+++?
5. Exclusive breastfeeding	+++++	+++	+++	+++++
6. Complete BF at each feed (i.e., emptying the breasts)	+++++	+++++	++++	?
7. Dietary diversity (number of food groups consumed)	+++++	+++++	+++	+++++
8. Birth weight	+++++	+++	++++	+++++
9. Speed of weaning	+++++	++++	+++++	?
10. Mother's intake of calories during pregnancy or lactation	+++++	+++	+++++	+++++
11. Maternal B1, B6 & B12 consumption during pregnancy or lactation	+++++	++	+++	++++
12. Vitamin A intake during pregnancy and lactation	+++++	++	++++	+++
13. Past history of diarrheal diseases	+++++	+++++	+++	+++++
14. Child's diet during illness	++++?	++++	++++	++++
15. Vitamin A intake (child)	++++	+++++	+++++	+++++
16. Vitamin B12 intake (child)	++++	++++	+++	+++++
17. Maternal consumption of fat during pregnancy and lactation	++++	+	++++	++++
18. Iron intake during pregnancy and lactation	++++	++	+++	+++++
19. Past history of measles (child)	++++	+++++	+++	+++++

[4] In general, we will call an association of 0.1 to 0.3 as +++, and 0.3-0.5 ++++, above 0.5 as +++++. For changes in Z-score, we will call statistically significant associations with more than 0.5 SDs +++++.

[5] Possibility of affecting with an intervention within Title II

[6] Prevalence, geographical distribution

Possible Determinant	Strength of Association[4] / Severity of Problem	Feasibility of Measurement	Susceptibility to Change[5]	Scope of Problem[6]
20. Past history of fever/malaria (child)	++++	+++++	++?	++++++
21. Past history of respiratory diseases (child)	++++	+++++	+++?	+++++
22. History of soil transmitted helminths, other parasites, and deworming	++++	++++	+++++	+++++
23. Age at which supplementary food started	+++	+++++	+++++	+++++
24. Magnesium intake (child)	+++?	+++++	+++++	??
25. Polyphenols: coffee, tea, & cocoa (Iron uptake inhibitors.)	+++?	+++++	+++++	+++?
26. Mother's intake of protein during pregnancy and lactation	+++?	++	+++	++++
27. Phytate to zinc (molar) ratio & Phytate/Fiber (child)	+++	++	++++	++++
28. Lycopene, flavonoids, & flavonols intake (child)	+++	++++	+++++	+++?
29. Number of pregnancies, child spacing	+++	++++	+++	+++++
30. Mother's intake of zinc during pregnancy/lactation	++?	++	++	++++
31. Threonine, Lysine, & Methionine intake (child)	+?	-	++	++++?
32. Cooking methods and vitamin preservation	+?	-	+	?
33. Calcium intake (child)	+	++++	+++	??
34. Copper intake (child)	??	++++	++++	+++?
35. Phosphorous intake (child)	??	++++	++++	??
36. Food taboos for child	??	++	+++	??
37. Mothers dietary taboos	??	++	+++	??
38. Vitamin B2 (Riboflavin) intake (child)	- ?	++++	+++	++++
39. Vitamin C intake (child)	-	++++	++++	+?
40. Vitamin E (Tocopherol) intake (child)	-	++++	++++	++?
41. Age breastfeeding terminated / Length of BF	-	+++++	+	++++
42. Exposure to sunlight to generate Vitamin D (child)	-	++	++++	+?
43. Maternal illness history	-	+++	?	?
44. Iodine intake (child)	++++	+++++	++++	+++++
45. Iron intake (child)	++++	+++++	+++	+++++
46. Potassium intake (child)	+++?	+++++	+++++	??
47. Immediate breastfeeding / giving colostrum	+++	+++++	++++	+++++

FOOD FOR THE HUNGRY INTERNATIONAL
Expanded Positive Deviance Inquiry Questionnaire

(PUT CHILD'S NUMBER AT TOP OF EACH PAGE)

TRIAGE PERSON ONLY: Fill in the box at right →

Name of Child: _____

Age of child in completed months: _____

Child's Cultural/Language Group: _____

Child's gender: _____

Name of Mother/Caregiver: _____

Mother/Caregiver's Age: _____ years

TRIAGE: CHECK EACH THAT IS TRUE
- ❑ **Mother has more than one child**
- ❑ **Mother does not have a child malnourished 0-59m of age**
- ❑ **Mother does not have a severe or atypical social or health situation.**
- ❑ **Child is between 12 and 59m of age.**
- ❑ **Child is not sick.**
- ❑ **Child is not losing weight currently for more than two months consecutively.**
- ❑ **Mother is not well to do**

Mother/Caregiver's relationship to child's father:
- ❑ **1. Father lives with Mother/Caregiver**
- ❑ **2. Father is dead**
- ❑ **3. Father is not known**
- ❑ **4. Father is known, but lives elsewhere**
- ❑ **5. Mother/Caregiver and father divorced**
- ❑ **6. Other**

Mother/Caregivers marital status:
- ❑ **1. Married to or living with one person monogamously**
- ❑ **2. Polygamous relationship**
- ❑ **3. Widowed**
- ❑ **4. Divorced**
- ❑ **5. Other (Specify:_____)**

Household type: ❑**1. Child lives with nuclear family only** ❑**2. Child is orphan** ❑**3. Child lives with extended family**[7]

How many children born before this child: ____ How many preschool children in house: ___

- ❑ **PD Child -- Weight _____.__ kg**
- ❑ **Malnourished Child -- Weight _____.__ kg**
- ❑ **Neither PD nor malnourished – Thank the Mother/Caregiver and end the interview.**

PART I OF THE QUESTIONNAIRE

Mother's Income-generating work

1. Aside from housework, have you done any work in the last 12 months for which you got paid in cash or in kind?
   ❑ Yes ❑ No

2. From what is the main material that your roof is made?
   ❑ 1. Grass, palm fronds
   ❑ 2. Zinc/metal
   ❑ 3. Cement/roof tiles
   ❑ 4. Other

[7] Living with extended family = Lives with one or more parents + one or more other relatives (not siblings)

I. Questions about Food & Feeding Practices

3. Have you ever breastfed (NAME)? ❑ Yes ❑ No → ***if NO, skip to #14***

4. At how many hours after the birth of (NAME) did you begin breastfeeding?
____ hours after birth

5. Did you give any other liquids or foods to (NAME) before breastfeeding for the first time?
❑ 1. Yes ❑ 2. No ❑ 3. Don't remember

6. Are you currently breastfeeding (NAME)? ❑ Yes ❑ No

7. When you breastfeed (or breastfed) (NAME), do you (or did you) usually completely empty your breasts?
❑ Yes, usually / always ❑ No, not usually / never

8. At how many months did you completely wean (NAME)? _____ months of age
❑ Still breastfeeding → ***If still breastfeeding, Skip to #10***

9. Did you stop breastfeeding (wean) (NAME) little by little or all at once?
❑ 1. Little by little
❑ 2. All at once (= one week or less from complete breastfeeding to complete stoppage).
❑ 3. Still breastfeeding.

10. At what age (in months) did you first begin giving any liquids or food other than breastmilk to (NAME) [including water]? _____ months of age

11. When you were (or while you are) breastfeeding (NAME), did you usually eat (or do you usually eat) any of the following foods?
(READ EACH FOOD IN EACH CATEGORY ONE-BY-ONE WAITING FOR A RESPONSE. MARK THE BOX BESIDE A CATEGORY IF THE MOTHER/CAREGIVER EATS ANY OF THE FOODS IN THAT CATEGORY.)

Yes	***No***	
❑	❑	*a. (â-Carotene foods:)* Grape leaves, pumpkin, mole, yellow sweet potato, carrots, apricots, greens (kale, spinach, collards, turnip greens), papaya, beets, yellow squash, onion tops, cantaloupe, red pepper, tomato paste, mango, or broccoli
❑	❑	*b. (Retinol foods:) Liver, kidney, [other organ meats including giblets], red palm oil, cod liver oil, tuna, margarine, butter, or cheese*
❑	❑	*c. (B1 [Thiamin] foods): Rice bran, sesame meal/seeds, sunflower seeds, cottonseed meal/flour, wheat germ, tahini, or sweet potato.*
❑	❑	*d. (B6 [Pyridoxine] foods): Rice or wheat bran, pistachio nuts, liver, garlic, safflower seeds, or saltwater fish.*
❑	❑	*e. (B12 foods:) Crustaceans, organ meats[8], fish, red meat, or cheese*
❑	❑	*f. (Zinc foods:) Red meat, crab, organ meats, nuts, cowpeas, or adzuki beans*
❑	❑	*g. (Protein foods:) Meat, poultry, fish, shellfish, eggs, beans, nuts, [locally-available legumes], or [locally-available pulses]*

12. During the months when you were breastfeeding (NAME), for how many months did you take iron supplements? ____ months

13. During the months when you were breastfeeding (NAME), did you regularly add fat – oil, lard, ghee, or margarine – to *your own* meals?
❑ 1. Yes ❑ 2. No ❑ 3. Don't remember

[8] This includes chicken giblets and gizzards.

14. When did you first give semi-solid or mashed food to (NAME)? _____ months of age

15. Have you ever bottle-fed (NAME)? ❑ 1. Yes ❑ 2. No ❑ 3. Don't remember

16. Are you currently bottle-feeding (NAME)? ❑ Yes ❑ No

17. What foods did you give to (NAME) to eat yesterday during the day and night? Tell me everything that (NAME) ate and drank yesterday from the time he (or she) woke up in the morning to the time she went to sleep at night. Be sure not to leave anything out.
(WRITE DOWN ALL FOODS MENTIONED – USE BACK IF NECESSARY.)
(INCLUDE INGREDIENTS OF ANY "COMBINATION FOODS.")

a.	_____	m.	_____
b.	_____	n.	_____
c.	_____	o.	_____
d.	_____	p.	_____
e.	_____	q.	_____
f.	_____	r.	_____
g.	_____	s.	_____
h.	_____	t.	_____
i.	_____	u.	_____
j.	_____	v.	_____
k.	_____	w.	_____
l.	_____	x.	_____

(ASK AFTER EACH FOOD, "Is there anything else?" PROBE FOR ANY ADDITIONAL FOODS.)

18. I am now going to ask about how many meals and how many snacks you usually feed (NAME). How many meals a day do you normally feed (NAME)? ____ meals

19. How many snacks a day do you normally feed (NAME)? _____ snacks

20. How many times a day do you breastfeed (NAME) currently? ____ breastfeeds
❑ Too many to count

21. Does (NAME) usually eat from a plate shared with others (the common plate), or does he (or she) have his (or her) own plate?
❑ 1. Common plate
❑ 2. His or her own plate

22. Does (NAME) usually eat the same food as the rest of the family, or do you usually prepare food separately for (NAME)?
❑ 1. Same food as rest of family
❑ 2. Food is prepared separately for child

23. What do you do when (NAME) does not want to eat or refuses to eat?
❑ 1. The mother/caregiver encourages or obliges the child to eat, or offers the child a gift or incentive to eat
❑ 2. Mother offers child another food.

- ❑ 3. The mother/caregiver does something else that is not an incentive or encouragement (SPECIFY:) _____
- ❑ 4. The mother/caregiver does nothing.

24. Do other people in the neighborhood ever feed (NAME)?
❑ Yes ❑ No ❑ Don't know

25. [Fill out the Food Frequency Table below:]

On how many days during the past week did (NAME) have…	**Number of Days the child ate this food:**
1. …hot peppers[9]?	
2. **porridge**?	
3. grape leaves?	
4. mole?	
5. pumpkin	
6. yellow sweet potato?	
7. carrots?	
8. apricots?	
9. greens (kale, spinach, collards, turnip greens)?	
10. papaya?	
11. beets?	
12. yellow squash?	
13. onion tops?	
14. cantaloupe?	
15. red peppers?	
16. tomato paste?	
17. mango?	
18. broccoli?	
19. liver?	
20. kidney?	
21. [other organ meats including giblets, gizzards, and capons]?	
22. red palm oil?	
23. cod liver oil?	
24. tuna?	
25. margarine?	
26. butter?	
27. cheese?	
28. saltwater fish?	
29. [shellfish]?	
30. [other marine products]?	
31. any fat (oil, lard, ghee, or margarine)?	
32. coffee?	
33. tea?	
34. cocoa?	
35. molasses?	
36. white beans?	
37. cowpeas?	
38. kidney beans?	
39. [other beans]?	
40. lentils?	
41. quinoa?	

On how many days during the past week did (NAME) have…	**Number of Days the child ate this food:**
42. potato?	
43. [red meats]?	
44. crab?	
45. nuts?	
46. cowpeas?	
47. adzuki beans?	
48. cassava?	
49. cocoyam?	
50. yam?	
51. un-sprouted seeds?	
52. bran?	
53. un-roasted nuts?	
54. (any) fish?	
55. [seeds]?	
56. pigeon peas?	
57. cow peas?	
58. amaranth?	
59. whole grains (oats, bulgur, barley, millet)?	
60. maize?	
61. cooked tomato products?	
62. guava?	
63. watermelon?	
64. tomatoes?	
65. onions?	
66. soy flour/meal?	
67. palm hearts?	
68. beans?	
69. peas?	
70. mushrooms?	
71. coconut meat?	
72. wild fowl?	
73. [Skip]	
74. goat cheese?	
75. [Skip]	
76. milk?	
77. fish?	
78. soy beans?	
79. almonds?	
80. eggs?	
81. poultry?	

[9] Substitute some food that is eaten locally, but *never* given to children.

26. In your opinion what foods should never be given to a child?
    - ❑ 1. Mother/caregiver mentions some foods that the child should never eat (taboos)
    - ❑ 2. Mother/caregiver does not mention any foods that the child should never eat (taboos)

27. In your opinion, what foods should never be eaten by a woman when she is breastfeeding?
    - ❑ 1. Mother mentions some foods that a lactating woman should never eat (taboos)
    - ❑ 2. Mother does not mention any foods that a lactating woman should never eat (taboos)

(TELL THE MOTHER: "We will now talk about pregnancy and the time when you were pregnant with (NAME).")

28. In your opinion, what foods should never be eaten by a woman when she is pregnant?
    - ❑ 1. Mother mentions some foods that a pregnant woman should never eat (taboos)
    - ❑ 2. Mother does not mention any foods that a pregnant woman should never eat (taboos)

29. During your pregnancy with (NAME), did you eat more than usual each day, less than usual, or the same as usual (in comparison to when you are not pregnant)?
    ❑ 1. more than usual ❑ 2. less than usual ❑ 3. the same as usual ❑ 4. don't know

30. When you were pregnant with (NAME), for how months did you take iron supplements? ____ months

31. When you were pregnant with (NAME), did you regularly add fat – that is oil, lard, ghee, or margarine – to your meals?
    ❑ 1. Yes ❑ 2. No ❑ 3. Don't remember

32. How large was (NAME) when he/she was born: very small, somewhat smaller than average, average, somewhat larger than average, or very large? ***(Repeat categories.)***
    ❑ 1. Very Small ❑ 2. Smaller than Average ❑ 3. Average
    ❑ 4. Larger than Average ❑ 5. Very Large

II. Questions on Child Care Practices

33. How often do you take (NAME) with you when you go outside the home to work or shop?
    ❑ 1. Always or almost always ❑ 2. Sometimes ❑ 3. Never/Almost never

34. At what age did you first leave (NAME) with someone else to take care of him/her?
    _____ months ❑ Mother has never left child with someone else

35. For how many hours of the day are you usually away from (NAME) most days?
    _____ hours (Use 0 if never or hardly ever away)

36. If you leave (NAME) at home with other caretakers, what advice do you usually give them?
    - ❑ 1. Mother/Caregiver mentions feeding advice
    - ❑ 2. Mother/Caregiver does not mention feeding advice
    - ❑ 3. Mother/Caregiver never leaves child at home with other caretakers

37. When you leave (NAME) at home with other caretakers, do you usually leave them food to give to the child? **(REMOVE EXTRA BOXES)**
    ❑ 1. Yes ❑ 2. No ❑ 3. Sometimes ❑ 4. Mother never leaves child with others.

III. Questions on Healthcare Seeking Behavior and Home Management of Sick Children

38. Has (NAME) suffered from any illnesses in the past two weeks?

    ❑ Yes ❑ No → ***if NO, go to #40***

39. What illnesses did (NAME) have in the past two weeks?
(Check off each that is mentioned.)
- ❑ a. Diarrhea
- ❑ b. Cold / Cough / Pneumonia / Rapid breathing
- ❑ c. Fever / Malaria
- ❑ d. Other illness (SPECIFY:) _____

40. Has (NAME) had measles in the past year?
❑ 1. Yes ❑ 2. No ❑ 3. Don't know

41. The last time that (NAME) had an illness, did you seek advice or help or treatment from anyone? ❑ **1.** Yes ❑ **2.** No ❑ **3.** Child never sick ***→ if NO or Never Sick, skip to #44***

42. How long after you noticed (NAME's) illness did you seek treatment?
❑ 1. Same day or next day ❑ 2. Two or more days later

43. Where did you first seek advice or help for (NAME) when he had an illness?
❑ 1. Trained health worker (*Socorrista*, Promoter, Nurse, Doctor, etc.)
❑ 2. Untrained person (traditional healer, family member, pharmacy worker, etc.)

44. The last time that (NAME) was sick, did you give (NAME) less food, the same amount of food, or more food than usual?
❑ 1. LESS food ❑ 2. SAME amount of food ❑ 3. MORE food ❑ 4. Never Sick

45. Do you have any bed nets in your house? ❑ Yes ❑ No ***→ if NO Skip to #48***

46. Who slept under a bed net last night?
❑ 1. Child (NAME) ❑ 2. Other (Specify):_____

47. Was the bed net ever soaked or dipped in a liquid to repel the mosquitoes or bugs?
❑ 1. Yes ❑ 2. No ❑ 3. Don't know

48. Has (NAME) been dewormed in the past six months?
❑ 1. Yes ❑ 2. No ❑ 3. Don't know

49. Is the salt that you use in (NAME)'s food iodized[10] or not iodized?
❑ 1. Iodized ❑ 2. Not iodized ❑ 3. Don't know

IV. World View[11]

50. Why do you think some children are skinnier and shorter than other children?
- ❑ 1. The mother/caregiver says that neighbors or other persons can make her child become malnourished, or mentions other "magic" causes.
- ❑ 2. The mother/caregiver mentions the will of God or other spiritual/religious reasons
- ❑ 3. The mother/caregiver does NOT mention neighbors or other person, magic causes, or spiritual/religious causes for why children become malnourished.

[10] Substitute for this question a question looking for a particular brand name of iodized salt, or otherwise reword to assure mothers are identifying iodized salt correctly. If an iodine test kit is available, have mothers bring salt or do the survey door-to-door, and test the salt for iodine.

[11] Be sure to do qualitative research with mothers about why children do not grow or become malnourished, and take that wording into account when developing questions for this section. For example, in Malawi, WR found that mothers said that children did not grow when their "spirits were sat upon".

51. Can a neighbor or another person in your community make a child lose weight by something that they do (e.g., curses, evil eye)?
❑ 1. Yes ❑ 2. No ❑ 3. Don't know

52. How serious do you think it is if a child is malnourished?
❑ 1. Not serious (It won't hurt the child) ❑ 2. A little serious (Child could get sick)
❑ 3. Serious (Child will certainly get sick) ❑ 4. Very serious (Child could die).

PART II OF THE QUESTIONNAIRE

V. Psychosocial & Other Environmental Factors

Mother/caregiver's Acceptance of (and Responsiveness to) Child

53. Over the past month, would you say that (NAME) pleased you very much, pleased you somewhat, frustrated you somewhat, or frustrated you a lot?
❑ 1. Please me very much
❑ 2. Pleased me somewhat
❑ 3. Frustrated me somewhat
❑ 4. Frustrated me a lot
❑ 5. Unsure how to answer

54. Sometimes children behave pretty well and sometimes they do not. On how many days, if any, have you or another member of your household had to hit or spank your child in the past week? ____ days.

55. At the time that you became pregnant with (NAME), did you want to become pregnant then, did you want to become pregnant later, or did you not want to have any/more children at all?
❑ 1. Wanted to become pregnant then
❑ 2. Wanted to become pregnant later
❑ 3. Did not want to have any/more children at all

Mother/Caregiver's Support Network

Only ask the following question if the mother is in a polygamous relationship, otherwise skip to question #58

56. How many other wives does your husband have? _____ other wives

57. What wife number are you?
❑ 1. First ❑ 2. Second ❑ 3. Other (Specify): _____

58. Over the past month did (NAME'S) father contribute money to support (NAME), such as paying for food or clothing?
❑ Yes ❑ No

59. Do any of your female adult relatives live in the same house or compound with you?
❑ Yes
❑ No

60. How often do you usually visit or talk with a friend or family member who lives outside of your household? ***(Read responses below if necessary.)***
❑ 1. Several times a day
❑ 2. Several times a week

- ❑ 3. Several times a month
- ❑ 4. Several times a year
- ❑ 5. Less than once a year / never

61. If you needed help or had a problem, is there someone from your family of origin who lives close by[12] whom you could count on to let you stay with them for a few nights?
❑ 1. Yes ❑ 2. No ❑ 3. Don't Know

62. If you needed help or had a problem, is there someone from your family of origin who lives close by whom you could count on for financial help?
❑ 1. Yes ❑ 2. No ❑ 3. Don't Know

63. During the past three months, how many times have you taken (NAME) to community health activities where a health promoter or doctor was present talking about prevention of diseases (e.g., immunization posts, child weighing posts)? ____ times

64. Think back over the past 12 months. Has anyone in your household, including yourself, been very sick or bedridden for a period of more than three months (including anybody who has since died)?
❑ Yes ❑ No If "Yes" how many people? _____ → ***If NO, skip to #66***

65. How old was/were the people who were sick for three months or more, or who died?
❑ 1. People are mentioned who WERE ILL between the ages of 15 and 49 (productive age) but did not die.
❑ 2. People are mentioned who WERE ILL AND HAVE DIED between the ages of 15 and 49 (productive age)
❑ **3. People are NOT mentioned who are between the ages of 15 and 49 (productive age)**

Mother/Caregiver's Relationship with Husband/Partner

66. How satisfied are you with your relationship with your husband/partner? ***(Read responses below if necessary.)***
- ❑ 1. Not at all / dissatisfied
- ❑ 2. Somewhat satisfied (a little bit)
- ❑ 3. Mostly satisfied
- ❑ 4. Completely satisfied.
- ❑ 5. Not married

67. On how many days out of a week does your husband/partner usually quarrel with you or with your children?
- ❑ 1. None (usually) / Never
- ❑ 2. One or two days a week
- ❑ 3. Three to five days a week
- ❑ 4. Six or more days per week
- ❑ 5. Not married / husband not living with mother.

68. Justifications given for a husband to abuse his wife (Check Yes, No, or Don't Know for each in accordance with what the caregiver believes.)			
Sometimes a husband is annoyed or angered by things which his wife does. In your opinion, is a husband justified in hitting or beating his wife/partner in the following situations:	**YES**	**NO**	**Don't Know**

[12] Who you could visit and return in one day.

a. If she goes out to do something without telling him?			
b. If she neglects the children?			
c. If she argues with him?			
d. If she refuses to sleep with / have sex with him?			
e. If she burns the food?			
f. Another reason? (Specify):			
Total			

69. Do you feel that anyone in your family should cut down on their drinking of alcohol?
❑ 1. Yes ❑ 2. No ❑ 3. Cannot say

Mother/caregiver Self-report of Depressive Symptoms

70. The following statements describe how people sometimes feel about themselves. For each question, please indicate how often you have felt this way during the past week. (*Circle number of best answer for each statement.)*

Circle the appropriate cell after reading the question below	Rarely or none of the time (0 days a week)	Some or a little of the time (1-2 days a week)	Occasionally or a moderate amount of time (3-4 days a week)	Most or all of the time (5-7 days a week)	Score (Put numbered circled here)
a. Over the past week, on how many days did you feel sad?	**1**	**2**	**3**	**4**	
b. Over the past week, on how many days did you feel lonely?	**1**	**2**	**3**	**4**	
c. Over the past week, on how many days did you have crying spells?	**1**	**2**	**3**	**4**	
d. Over the past week, on how many days would you say you enjoyed life?	**4**	**3**	**2**	**1**	
e. Over the past week, on how many days would you say you felt depressed?	**1**	**2**	**3**	**4**	
f. Over the past week, on how many days would you say you felt little interest or pleasure in doing things?	**1**	**2**	**3**	**4**	
				Total Score:	

Hygiene Practices Taught to Child

71. What hygiene practices do you normally teach (NAME)?
(MARK ALL THAT APPLY. ASK, "Anything else?" AFTER EACH RESPONSE.)
- ❑ a. Wash hands with soap (or ashes) before eating
- ❑ b. Wash hands with soap (or ashes) after defecating
- ❑ c. Defecate in a latrine or potty
- ❑ d. Don't put hands in drinking water containers
- ❑ e. Use receptacle reserved for retrieving water to remove drinking water
- ❑ f. Only drink purified water (don't drink from streams/puddles etc.)
- ❑ g. Keep flies away from food.

- ❑ h. Keep away from animal feces.
- ❑ i. Keep away from animals.
- ❑ j. Keep away from human feces.
- ❑ k. Wash fruits and vegetables before eating them.
- ❑ l. Avoid food that has touched the ground
- ❑ m. Avoid food that has been touched by animals or birds.
- ❑ n. Other: (Specify): _____
- ❑ o. Don't Know
- ❑ p. None

Handwashing

72. Have you used soap or ashes today or yesterday for cleaning or washing? If so, what did you use it for?
    - ❑ 1. Care giver mentions soap or ashes for hand washing.
    - ❑ 2. Care giver does not mention soap or ashes for hand washing. → ***Skip to #74***

73. When did you wash your hands with soap or ashes?
    (MARK ALL THAT APPLY. ASK, "Any other time?" AFTER EACH RESPONSE.)
    - ❑ a. When bathing
    - ❑ b. Before preparing food
    - ❑ c. After defecating
    - ❑ d. Before feeding children or breastfeeding
    - ❑ e. After attending to a child who has defecated
    - ❑ f. Other (Specify: _____)

Disposal of child's feces

74. The last time (NAME) passed stool, where did he/she defecate?
    - ❑ **1.** Used sanitation facility (e.g., latrine, flush toilet)
    - ❑ **2.** Used potty (indoor pot or pan)
    - ❑ **3.** Used washable diapers
    - ❑ **4.** Used disposable diapers
    - ❑ **5.** Went in house/yard
    - ❑ **6.** Went outside the premises
    - ❑ **7.** Went in his/her cloths
    - ❑ **8.** Other (Specify): _____
    - ❑ **9.** Don't know

Drinking Water

75. Do you usually store water for drinking in the household?
    - ❑ 1. Yes
    - ❑ 2. No → ***If NO, fill in response 4 for #76 and skip to #77***
    - ❑ 3. Don't know → ***If NO, fill in response 4 for #76 and skip to #77***

76. How many of the containers used in your home for drinking water are usually covered?
    - ❑ 1. All are
    - ❑ 2. Some are
    - ❑ 3. None are
    - ❑ 4. *Water not stored in household*

77. In the past week, did you do anything to the water given to (NAME) to make it safer to drink? If so, what?
(MARK ALL THAT APPLY. ASK, "Anything else?" AFTER EACH RESPONSE.)
- ❑ a. Did nothing / did not treat
- ❑ b. Boil
- ❑ c. Add bleach/chlorine
- ❑ d. Sieve it through cloth
- ❑ e. Water filter (ceramic, sand, composite)
- ❑ f. Solar disinfection
- ❑ g. Sedimentation
- ❑ h. Other (Specify):_____

Food Management Practices

78. Can you tell me how you keep food safe to eat?
(MARK ALL THAT APPLY. ASK, "Anything else?" AFTER EACH RESPONSE.)
- ❑ a. Wash hands before preparation
- ❑ b. Wash hands before eating
- ❑ c. Wash utensils and containers before preparation
- ❑ d. Wash food thoroughly
- ❑ e. Cook food thoroughly
- ❑ f. Consume all food at once
- ❑ g. Avoid keeping leftovers
- ❑ h. Reheat leftovers well before eating
- ❑ i. Cover food containers
- ❑ j. Prevent flies from touching the food
- ❑ k. Keep food in cold place
- ❑ l. Keep food behind doors or screen
- ❑ m. Use clean utensils for retrieving food
- ❑ n. Other (specify): _____
- ❑ Z. Don't know

Thank the mother and take the mother and child to the nurse drawing blood samples:

79. Palmar Pallor? ❑ Yes ❑ No / Not sure

80. Hemoglobin level of child: ___._ g/dl ❑ Unable to get sample / mother unwilling

THANK THE MOTHER FOR HER TIME!

Burundi Local Determinants of Malnutrition Study
Factors Associated with Diarrhea in Past Two Weeks

Factor	OR	p-value
Not teaching child to wash fruits/vegetables before consumption: 0% of those who teach their child to wash fruits and vegetables before consuming had diarrhea in the past two weeks vs. 39% of those who did not.[13]	0.0	0.02
Lack of consumption of Vitamin A rich foods during lactation: 32% of those who ate vitamin A rich foods during lactation had diarrhea vs. 86% who did not.[13]	0.08	0.004
Being younger than the average age: Being young: 58% of younger than median had diarrhea vs. 10.9% of older children.	11.5	0.00000
Early weaning: 44% of those who weaned children <24m had diarrhea vs. 8.3% of those who did not.[14]	8.74	0.001
Give 5+ feedings/day: 46% of those who gave five or more meals/snacks in the past day had diarrhea vs. 10.7% of those who did not.[14]	6.94	0.001
Gender: 54% of boys had diarrhea vs. 15.2% of girls had diarrhea in the past two weeks. [14]	0.15	0.0000
Not using clean utensils: 9.1% of mothers who say that they use clean utensils to retrieve food had a child with diarrhea vs. 38.6% of those who did not.[13]	0.16	0.049
Visiting friend/family members often: 45% of mothers who say that they visit a friend or other family outside of the HH several times a week or several times per day or per week had diarrhea vs. 13% of those who say they visit several times a month or less.[13]	5.4	0.002
Taking child to market: 58% of those who always take the child with them to the market had diarrhea vs. 21% of those who do not. [14]	5.37	0.0002
Being smaller at birth: 28% of children of mothers who say the child was average, large than average, or very large had diarrhea vs. 67% of those who said child was smaller than normal or very small. [14]	0.19	0.002
Nutritional Status: 52% of Malnourished (WAZ<-2) had diarrhea vs. 17% of positive deviants (WAZ>-1) had diarrhea. [14]	5.2	0.000
Giving prelacteal feeds: 63.6% of those who received prelacteal feeds had diarrhea vs. 33% of those who did not. [14]	3.63	0.04
Giving solid/semi-solid foods @ 6-10m: 40% of those who gave first solid/semi-solid food between 6-10m of age had diarrhea vs.	3.56	0.04

[13] Zero cell: cannot test for confounding by age.
[14] No evidence of confounding by age.

Factor	OR	p-value
16% of those who were not. [14]		
Not taking iron supplements during pregnancy: 18% of women who took any iron supplements during pregnancy had diarrhea vs. 43% of those who do not. [14]	0.29	0.02
Not teaching child handwashing with soap: 23% of those who teach their child to wash hands with soap before eating had diarrhea vs. 47% of those who do not. [14]	0.35	0.02
Not defecating in proper place: 21.6% of those who defecated in a proper place had diarrhea vs. 44% of those who did not. [14]	0.35	0.03
Believing in taboo foods during lactation: 49% of those who say that there are taboo foods during lactation had diarrhea vs. 26% of those who say that there are not taboo foods during lactation. [14]	0.36	0.02
Lack of consumption of protein-rich foods during lactation: 31% of those who ate high-protein foods during lactation had diarrhea vs. 50% of those who did not. *[Note: Small amount of confounding by age.]*	0.44	0.08