

# LOCAL DETERMINANTS OF MALNUTRITION

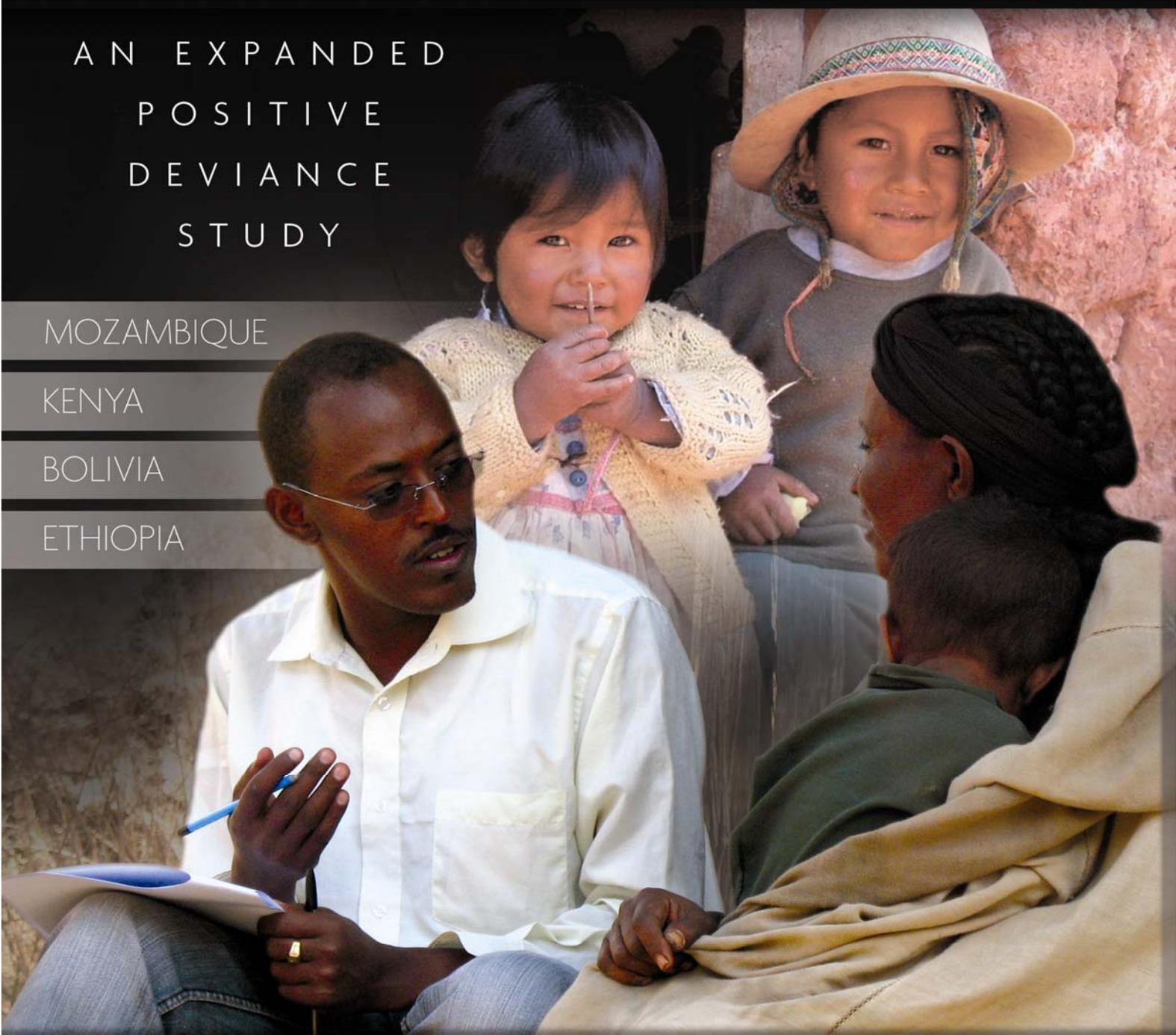
AN EXPANDED  
POSITIVE  
DEVIANCE  
STUDY

MOZAMBIQUE

KENYA

BOLIVIA

ETHIOPIA



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## ***Table of Contents***

	Page
<b>I. <u>Background on the Approach and Development of the Study Instruments and Protocol</u></b> .....	1
A. Background.....	1
B. Literature Review.....	4
C. Findings from the Literature Review .....	4
D. The Local Determinants of Malnutrition Study Methodology - Mozambique .....	4
E. The Local Determinants of Malnutrition Study Methodology – Kenya, Bolivia, and Ethiopia.....	5
F. Analysis of the Data .....	5
<b>II. <u>Statistically-Significant Findings - Mozambique</u></b> .....	6
1. Demographics.....	6
2. Mother’s Income-generating work.....	6
3. Child Feeding Practices .....	6
4. Foods Consumed by the Mother during pregnancy and breastfeeding .....	7
5. Specific Foods Consumed by the Child .....	7
6. Child Care Practices.....	8
7. Healthcare Seeking Behavior and Home Management of Sick Children.....	8
8. Mother’s (or Caregiver’s) World View .....	9
9. Mother/Caregiver’s Acceptance of (and Responsiveness to) Child .....	9
10. Stimulation Given to Child .....	10
11. Mother/Caregiver’s Support Network.....	10
12. Mother/Caregiver’s Relationship with Husband/Partner .....	11
13. Mother/caregiver’s Self-report of Symptoms of Depression.....	11
14. Hygiene Practices.....	11
15. Particular Nutrients.....	12
<b>III. <u>Implications Based on Results of LDM Study for Mozambique</u></b>	13
<b>IV. <u>Statistically-Significant Findings - Kenya</u></b> .....	17
<b>V. <u>Implications Based on Results of LDM Study for Kenya</u></b> .....	22
<b>VI. <u>Statistically-Significant Findings - Bolivia</u></b> .....	26
<b>VII. <u>Implications Based on Results of LDM Study for Bolivia</u></b> .....	32
<b>VIII. <u>Statistically-Significant Findings – Ethiopia</u></b> .....	35
<b>IX. <u>Implications Based on Results of LDM Study for Ethiopia</u></b> .....	39

**X. Conclusions.....43**

**Annex A:** A) Condensed Matrix of Localized Determinants of Malnutrition (Related to Environment/Care) ..... 44  
 B) Matrix of Possible Localized Determinants of Malnutrition (Related to Intake/Illness History)..... 48

**Annex B:** Expanded PD Questionnaire (English versions, modified in each field)..... 52

**Annex C:** Results that Were NOT Statistically Significant - Mozambique ..... 64

**Annex D:** Results that Were NOT Statistically Significant - Kenya..... 72

**Annex E:** Results that Were NOT Statistically Significant - Bolivia ..... 79

**Annex F:** Results that Were NOT Statistically Significant – Ethiopia.....86

**Annex G:** Modifications to the Questionnaire in Bolivia.....92

# Local Determinants of Malnutrition: an Expanded Positive Deviance Study

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

### A. Background

This 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.

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<sup>1</sup>, intake of specific nutrients (e.g., magnesium, potassium and phosphorus<sup>2</sup>), 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,

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- <sup>1</sup> 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.
  - <sup>2</sup> 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/pfedat/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.

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 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).

Within the context of USAID/FFP’s new strategic framework, and the implications and needs identified in the field during its Institutional Support Activity (ISA) grant, Food for the Hungry (FH) identified five priority areas that are being addressed under its current Institutional Capacity Building (ICB) Program. They are:

- 1) reducing food insecurity in vulnerable populations by selecting or developing innovative tools to assess vulnerabilities and predict and mitigate food security risks and shocks;
- 2) field guidance for the effective utilization of Title II resources with a focus on food as food;
- 3) capacity building of food security partners;
- 4) new country program assessment and initiation; and
- 5) collaboration to create an evidence base and best practices in Title II programming.

This study was carried out to respond to the first, third and fifth priority areas. 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 various workshops in Mozambique (September 2004), Kenya (September 2005), Bolivia (August 2007), and Ethiopia (May 2008). During these workshops, participants learned how to carry out an “expanded PD study” that helped them to identify these local determinants of malnutrition which may increase a child’s vulnerability to food insecurity. The results of these studies are summarized in this report.

To conduct the studies, mothers of children 12-59m were divided into three groups – those with a child who is well nourished (weight-for-age Z score (WAZ) $>-1.0$ ), those who were malnourished (WAZ $<-2.0$  or HAZ $<-2.0$ ) and those who fall in between those two groups. After the first day of interviewing, weights only were used to classify children as PD or malnourished, since problems were seen with measuring height in some children. Mothers of those who fell between the two limits received a brief health talk and returned home. A longer PD questionnaire was used to interview the remaining mothers of PD and malnourished children 12-59m of age. After the surveys, we compared the data from these two groups to determine how the two groups differ on each question and scales based on series of questions. The data from this study is providing Food for the Hungry with more insights into what practices and foods should be promoted each country context, and what additional interventions should be added to FH’s health and nutrition programs.

### Finding Associations, Not Causes

One thing that we should mention 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.

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.

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). We can see a possible 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 the child’s hands). Since we can see a possible mechanism, if we find 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 and see if it helps reduce malnutrition.

### Expanded PD Study vs. Hearth

Please keep in mind that this “expanded PD study” is not a study that would be done as part of the Hearth nutritional rehabilitation model. In that model, 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 Hearth. 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 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 expanded PD 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 Local Determinants of Malnutrition (LDM) study would be conducted at the beginning of a project period (as a stand-alone study) in order to identify what interventions are 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. We first examined positive deviance studies and then looked at other studies on malnutrition that provided information on the causes. We specifically looked for causes dealing with nutrient intake, feeding practices, and psycho-social causes.
- We then developed matrices (see **Annex A**) 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). We scored each of the possible determinants. The determinants with the highest scores were then slated for inclusion in the questionnaire.
- A questionnaire was developed (**Annex B**) that included questions that have been used in other PD studies and ones that we developed 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. The Local Determinants of Malnutrition Study Methodology - Mozambique**

The study was carried out in Mozambique by Tom Davis, MPH (FH's Director of Health Programs), and Aduigna Kebede, FH/Mozambique's Health and Nutrition Program Manager in September 2005. Participants in the workshop included the Title II health programs' District Coordinators, Supervisors, and selected Health Promoters. Participants had past experience with conducting interviews as part of KPC surveys and other quantitative and qualitative studies.

1. Participants were divided into two teams. Each team was composed of four interviewers and one supervisor. Each team visited a different community.
2. Each team attempted to interview at least 15 mothers of malnourished children and 15 PD children (according to criteria established for choosing each group). In the two communities combined, interviewers were able to find 21 PD children and 33 malnourished children in these communities.
3. A designated team member (e.g., the Supervisor) read and explained the informed consent statement to the mothers. Each mother was reminded of the informed consent statement prior to the actual interview, as well. Mothers who choose not to participate were to be thanked for their time. (All mothers chose to participate).
4. Team members worked together to first weigh and measure both mothers and children. (We were unable to analyze mothers' BMI because we lacked height data on many mothers. Later, we decided to remove both height and weight measurement of mothers from the study, and height measurement for children, given time and logistical considerations.) The mothers of children who were neither PD nor malnourished were thanked for their involvement, received a brief health talk, and were sent home. The mothers who were in the survey did *not* participate in this health talk or hear it since it might have influenced their answers.

5. Mothers selected for interviews sat together and were called out for the interview (in a private area). Supervisors were responsible for assuring that the questionnaire was being used appropriately by each interviewer and that mothers were guided to the proper locations for interviews or snack/waiting. The Supervisor also helped fill in the box where mother's caregiving behavior was observed. (This was also later removed from future surveys since there was not adequate opportunity to observe mothers' caregiving behavior.) Supervisors checked the completed questionnaires to be sure that they were filled out properly. If there were any questions that were not filled in properly, the Supervisor asked the mother those questions and completed the questionnaire.

### **E. The Local Determinants of Malnutrition Study Methodology – Kenya, Bolivia, and Ethiopia**

The subsequent studies in Kenya, Bolivia, and Ethiopia followed approximately the same study protocol described above (with changes as noted above). Each field strived to interview a total of 45 mothers of PD children and 45 mothers of malnourished children in the course of the workshop.

The study in Kenya was carried out by Tom Davis, MPH (Director of Health Programs) and Grace Litali, FH/Kenya Health and Nutrition Program Manager during September, 2005. Participants in the training included 15 FHI/Kenya staff members and one Kenya Ministry of Health (MOH) leader.

Due to a serious family health problem, Tom Davis trained Sarah Sywulka and Janelle Porter to conduct the study in Bolivia through a three-day training-of-trainers event in North Carolina. Ms. Sywulka and Ms. Porter, aided by Julie Hettinger, MS, RD and Dr. Zulema Torres, Health and Water & Sanitation Program Coordinator, both of FH/Bolivia, then conducted the training and study in Bolivia with 18 staff in August 2007.

The final study in Ethiopia took place May, 2008, led by Julie Hettinger, Maternal and Child Nutrition Specialist, with support from Tom Davis. Participants in the training who conducted the study included 8 FH/Ethiopia health and livelihoods staff members, 3 staff from a collaborating national PVO, and 2 Ethiopian MOH staff.

### **F. Analysis of the Data**

Data was entered and tabulated using a program written by FH's Director of Health Programs using Epi-Info 6.04d. This program tabulated responses for each questionnaire and calculated scores (e.g., tolerance of abuse, social support) based on multiple questions. Findings from this analysis are included in the sections below. Differences between the PD and malnourished groups were considered to be statistically significant if  $p$  was 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. For the Bolivia study, we considered some findings (noted in the report) with a higher  $p$ -value ( $0.2 < p < 0.05$ ) since sample size was small and there were few findings at lower significance levels ( $p < 0.05$ ). The study was continued in Bolivia in November 2007, with the subsequent significant findings highlighted in the text (i.e. "during the subsequent analysis").

## **II. Statistically-Significant Findings - Mozambique**

Complete results that were not statistically significant are mentioned in **Annex C**. Statistically-significant results are highlighted in the shaded boxes below.

### **1. *Demographics:***

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- child's age
- 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
- number of siblings

### **2. *Mother's Income-generating work***

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- Mother doing cash work in last 12m
- Mother deciding how to spend money
- Roof construction (proxy for SES)

### **3. *Child Feeding Practices***

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- Child (ever) breastfed
- Initiation of breastfeeding (in hours after birth)
- Giving pre-lacteal feeds
- Age at complete weaning
- Speed of weaning
- Exclusive breastfeeding to six months
- Introduction of solids in child's diet at 6-10m of age
- Bottle feeding (ever)
- Current bottle feeding
- Consumption of five or more daily feeds by child
- Consumption of at least one snack daily
- 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
- Mother having food taboos concerning foods she eats during pregnancy
- Amount of food eaten during pregnancy (self report) compared with usual level of eating
- Size of child at birth (mother's report)

***Concerning feeding practices, the following differences between PD and malnourished children were found to be statistically-significant:***

- c. 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.
- d. 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.
- e. 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.

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

No statistically-significant differences were found between PD and malnourished children concerning the mother's diet during pregnancy or lactation as measured by the following variables:

- Consumption of  $\beta$ -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  $\beta$ -carotene foods during breastfeeding
- Mother's consumption of retinol-rich foods during breastfeeding
- Mother's consumption of B1-rich foods during breastfeeding
- Mother's consumption of B6-rich foods during breastfeeding
- Mother's consumption of B12-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

**5. *Specific Foods Consumed by the Child***

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

- f. 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.

- g. **Whole grains** ( $p=0.0002$ ; PD avg = 4.2; Mal avg = 1.36): Eaten more than three times as often by PD children.
- h. **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.
- i. **Fish (any type)** ( $p=0.0021$ ; PD avg = 2.8; Mal avg = 1.39): Eaten two times more often by PD children.
- j. **Beans** ( $p=0.013$ ; PD avg = 2.105; Mal avg = 0.879): Eaten 2.4 times more often by PD children.
- k. **Cassava** ( $p=0.02$ ; PD avg = 2.9; Mal avg = 1.485): Eaten almost twice as often by PD children.
- l. **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:

- **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 (>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])

## 6. **Child Care Practices**

No statistically-significant differences were found between PD and malnourished children concerning the mother's diet during pregnancy or lactation as measured by the following variables:

- 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
- 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

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

No statistically-significant differences were found between PD and malnourished children concerning the mother's healthcare seeking behavior and home management of sick children as measured by the following variables:

- Child ill during the past two weeks
- Child ill with ARI during the past two weeks
- Child ill with fever or malaria during the past two weeks
- Child ill with measles during the past year

- Mother sought help for illness the last time the child was ill ( $p=0.065$ )
- 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
- Mother regularly uses iodized salt in the child's food

***Statistically-significant differences were seen between mothers of PD and mothers of malnourished children concerning the following variables:***

- m. 0% of PD children were ill with diarrhea during the past two weeks vs. 29% of malnourished children. ( $p=0.02$ )
- n. 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].)

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

No statistically-significant differences were found between PD and malnourished children concerning the mother's world view as measured by the following variables:

- 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

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

No statistically-significant differences were found between PD and malnourished children concerning the mother or caregiver's acceptance of – and responsiveness to – the child as measured by the following variables:

- Average responsiveness score (mother's responsiveness to child -- how the mother was observed to speak to and touch her child during a period of supervised interaction)
- Whether or not mothers touched their child often during the supervised session
- Speaking gently to the child during the supervised session
- How mother knows if child is hungry
- Whether or not mother says that she usually responds to their child's demands for attention when she is doing housework
- Degree to which the mother says that her child has pleased her in the past month
- Whether or not the mother corrects the child appropriately (telling "no", having child sit/quiet time, putting things out of reach, distracting, or picking up to comfort)
- Whether or not mothers wanted their pregnancy

***Statistically-significant differences were seen between mothers of PD and mothers of malnourished children concerning the following variable:***

- o. 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.

#### 10. **Stimulation Given to Child**

No statistically-significant differences were found between PD and malnourished children concerning the mother or caregiver's stimulation of the child as measured by the following variables:

- Types of toys that child plays with
- Learning events in the past week
- Number of days in which the father was involved with the child in the past week (in specific ways)
- Average social stimulation score

#### 11. **Mother/Caregiver's Support Network**

No statistically-significant differences were found between PD and malnourished children concerning the mother or caregiver's support network as measured by the following variables:

- Number of types of help mother receives from her family of origin over the past month
- 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)
- Whether or not fathers contribute money to support the child
- Whether or not the mother has a female relative living in the same house or compound with her
- How often the mother of the child visits or talks with other friends or family outside of the household
- Whether or not the mother has someone in her family of origin who lives close by (whom she could count on to let her stay with them for a few nights)
- Whether or not the mother says that there is someone from her family of origin who lives close by who she could count on for financial help

#### ***Statistically-significant differences were seen between mothers of PD and mothers of malnourished children concerning the following variables:***

- p. Average social support score of mother (scale does include caring for a family member with a chronic illness): 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.
- q. 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. ( $p=0.002$ ) 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).

### **12. *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 as measured by the following variables:

- 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

### **13. *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 as measured by the following variables:

- 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

### **14. *Hygiene Practices***

No statistically-significant differences were found between mothers of PD and malnourished children concerning the mother or caregiver's hygiene practices as measured by the following variables:

- Number of hygiene practices the mother or caregiver regularly teaches her child
- Hygiene index of mother's or caregiver's practices
- 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
- 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
- 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

***Statistically-significant differences were seen between mothers of PD and mothers of malnourished children concerning the following variable:***

- r. 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 ( $p=0.006$ ).

### 15. *Particular Nutrients*

No statistically-significant differences were found between mothers of PD and malnourished children concerning consumption of the following nutrients by children:

- $\beta$ -Carotene-rich foods
- Retinol-rich foods
- Iodine foods
- High-fat foods
- Foods rich in Inhibitors
- Iron-rich foods
- Zinc-rich foods
- Phytate-rich foods
- B12-rich foods
- Foods rich in Lycopene, flavonoids or flavonols
- Copper-rich foods
- Phosphorous-rich foods
- High protein foods

#### ***Statistically-significant differences were seen between PD and malnourished children concerning the consumption of the following nutrients:***

- s. ***B2-rich foods:*** 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.
- t. ***Potassium-rich foods:*** 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.
- u. ***Magnesium-rich foods:*** 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.

**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** 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** 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 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).

### **III. Implications Based on Results of LDM Study for Mozambique**

Given these results, FH/Mozambique discussed the findings and suggested the actions summarized on the following pages, and is considering integrating several educational messages and design changes in its Title II and other nutrition programs in the future.

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

Finding	Suggested Action	Suggested Educational Messages
<p>Mothers of PD children were seven times more likely to <b>completely empty their breasts when breastfeeding</b></p>	<ul style="list-style-type: none"> <li>➤ Explore why PD mothers are more likely to do this. Is it due to child's level of hunger? Learned practice?</li> <li>➤ Promote message related to this through programs.</li> <li>➤ Explore mothers' feelings about doing this behavior, confront any barriers to it, and promote any positive aspects of the behavior that they mention</li> </ul>	<ul style="list-style-type: none"> <li>➤ 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.</li> </ul>
<p>Mothers of PD children were more than four times as likely to <b>take iron supplements while they were breastfeeding</b></p>	<ul style="list-style-type: none"> <li>➤ Look into government policy concerning iron supplementation of mothers during lactation. Increase supplementation during lactation.</li> <li>➤ Look into why some mothers do this and others do not.</li> <li>➤ 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.</li> <li>➤ Re-examine data to look for dosage effect of iron supplementation on HAZ and WAZ.</li> </ul>	<ul style="list-style-type: none"> <li>➤ All mothers should take iron supplements during pregnancy as a way to help their children grow.</li> <li>➤ Look up recommendations on iron supplementation during lactation.</li> </ul>
<p>Mothers of <i>malnourished</i> children are more likely to encourage their non-hungry child to eat</p>	<ul style="list-style-type: none"> <li>➤ Look into why this is true. Have the mothers in this study participated in a hearth nutritional rehabilitation workshop?</li> </ul>	

Finding	Suggested Action	Suggested Educational Messages
<p>The following foods were found to be associated with positive deviance:</p> <ul style="list-style-type: none"> <li>➤ <b>Maize</b></li> <li>➤ <b>whole grains</b></li> <li>➤ <b>cabbage</b></li> <li>➤ <b>fish</b></li> <li>➤ <b>beans</b></li> <li>➤ <b>cassava</b></li> <li>➤ <b>pumpkin</b></li> </ul>	<ul style="list-style-type: none"> <li>➤ Look at ways to make these foods more accessible to families.</li> <li>➤ Encourage the planting of some of these foods in home gardens.</li> <li>➤ Create hearth meals using these foods. Get costs on each to come up with the least expensive meals.</li> <li>➤ 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).</li> </ul>	<ul style="list-style-type: none"> <li>➤ 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.</li> <li>➤ 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.</li> <li>➤ 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.</li> </ul>
<p>0% of PD children were ill with <b>diarrhea</b> during the past two weeks vs. 29% of malnourished children</p>	<ul style="list-style-type: none"> <li>➤ 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.</li> <li>➤ Consider zinc supplementation during diarrheal episodes to shorten prevalence and protect against future episodes.</li> <li>➤ Increase promotion of water purification methods (in particular), hand washing, and other hygienic practices.</li> </ul>	<ul style="list-style-type: none"> <li>➤ 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.</li> <li>➤ [Water purification messages – see below.]</li> <li>➤ [Hygiene messages – see below.]</li> </ul>
<p>0% of PD children were ill with <b>an illness other than diarrhea, ARI, fever or malaria</b> during the past two weeks vs. 29% of malnourished children</p>	<p>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.</p>	

Finding	Suggested Action	Suggested Educational Messages
Mothers of PD children had a <i>lower</i> 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 <i>mothers of the PD children</i> said that there was at least one person in their household who had either been <b>very sick or bedridden</b> (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 <i>better</i> 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 <b>drinking water was purified</b> were 3.6 times more likely to be PDs.	<ul style="list-style-type: none"> <li>➤ Water treatment methods used were boiling (30%), adding bleach/chlorine (17%), sieving (11%), filtration (4%), and solar purification (2%).</li> <li>➤ Explore why chlorination is not used routinely.</li> <li>➤ Heavily promote chlorination of water using bleach.</li> </ul>	<ul style="list-style-type: none"> <li>➤ All water consumed by your family should be treated to prevent diarrhea and other diseases.</li> <li>➤ To purify water, use four drops of bleach per liter of water.</li> </ul>
<b>B2, potassium, and magnesium</b> appear to be associated with positive deviance in this population	<ul style="list-style-type: none"> <li>➤ Promote frequent consumption by children of foods rich in these nutrients. (Foods rich in these nutrients are listed earlier in this report.)</li> <li>➤ 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.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Be sure to use legumes, nuts, and peas in the meals you fix for younger children. They help the child to grow well.</li> <li>➤ (Promote consumption of other foods rich in these three nutrients.)</li> </ul>

## **IV. Statistically-Significant Findings – Kenya**

Complete results that were not statistically significant are mentioned in **Annex D**. Statistically-significant findings are highlighted in the shaded boxes below.

### **1. Demographics:**

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- 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
- number of siblings

***A statistically-significant difference was seen between PD children and malnourished children concerning the age of the child:***

- a. Malnourished children were on average nine months older than PD children ( $p=0.002$ ) (expected)

### **2. Mother's Income-generating work**

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- Mother doing cash work in last 12m
- Mother deciding how to spend money
- Roof construction (proxy for SES)

### **3. Child Feeding Practices**

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- Child (ever) breastfed
- Initiation of breastfeeding (in hours after birth)
- Giving pre-lacteal feeds
- Age at complete weaning
- Speed of weaning
- Exclusive breastfeeding to six months
- Introduction of solids in child's diet at 6-10m of age
- Bottle feeding (ever)
- Current bottle feeding
- Consumption of at least one snack daily
- 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
- Mother having food taboos concerning foods she eats during pregnancy
- Amount of food eaten during pregnancy (self report) compared with usual level of eating

- Size of child at birth (mother's report)

**Concerning feeding practices, the following difference between PD and malnourished children was found to be statistically-significant:**

b. PD children consumed on average 3.4 meals per day whereas malnourished children consumed 2.9 meals per day ( $p=0.05$ )

#### 4. **Foods Consumed by the Mother during pregnancy**

No statistically-significant differences were found between PD and malnourished children concerning the mother's diet during pregnancy or lactation as measured by the following variables:

- Consumption of  $\beta$ -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  $\beta$ -carotene foods during breastfeeding
- Mother's consumption of retinol-rich foods during breastfeeding
- Mother's consumption of B1-rich foods during breastfeeding
- Mother's consumption of B6-rich foods during breastfeeding
- Mother's consumption of B12-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

#### 5. **Specific Foods Consumed by the Child:**

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

c. **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.**

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

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

#### 6. **Child Care Practices**

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- Mother always takes child with her when outside of home
- Average age at which mother leaves child at home with someone else
- 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

***Statistically-significant differences were seen between mothers of PD and mothers of malnourished children concerning the following variable:***

f. 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. ( $p=0.027$ ).

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

No statistically-significant differences were found between PD and malnourished children concerning the mother's healthcare seeking behavior and home management of sick children as measured by the following variables:

- Child ill during the past two weeks
- Child ill with ARI during the past two weeks
- Child ill with fever or malaria during the past two weeks
- Child ill with measles during the past year
- 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
- Mother regularly uses iodized salt in the child's food

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

No statistically-significant differences were found between PD and malnourished children concerning the mother's world view as measured by the following variables:

- 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

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

No statistically-significant differences were found between PD and malnourished children concerning the mother or caregiver's acceptance of – and responsiveness to – the child as measured by the following variables:

- Average responsiveness score (mother's responsiveness to child -- how the mother was observed to speak to and touch her child during a period of supervised interaction)
- Whether or not mothers touched their child often during the supervised session
- Speaking gently to the child during the supervised session
- How mother knows if child is hungry
- Whether or not mother says that she usually responds to their child's demands for attention when she is doing housework
- Degree to which the mother says that her child has pleased her in the past month
- Whether or not the mother corrects the child appropriately (telling "no", having child sit/quiet time, putting things out of reach, distracting, or picking up to comfort)
- Whether or not mothers wanted their pregnancy

**Statistically-significant differences were seen between mothers of PD and mothers of malnourished children concerning the following variable:**

g. 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)

#### **10. Stimulation Given to Child**

No statistically-significant differences were found between PD and malnourished children concerning the mother or caregiver's stimulation of the child as measured by the following variables:

- Types of toys that child plays with
- Learning events in the past week
- Number of days in which the father was involved with the child in the past week (in specific ways)
- Average social stimulation score

#### **11. Mother/Caregiver's Support Network**

No statistically-significant differences were found between PD and malnourished children concerning the mother or caregiver's support network as measured by the following variables:

- Number of wives the mothers husband has
- Number of types of help mother receives from her family of origin over the past month
- 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)
- Whether or not fathers contribute money to support the child
- Whether or not the mother has a female relative living in the same house or compound with her
- How often the mother of the child visits or talks with other friends or family outside of the household
- Whether or not the mother has someone in her family of origin who lives close by (whom she could count on to let her stay with them for a few nights)
- Whether or not the mother says that there is someone from her family of origin who lives close by who she could count on for financial help
- Whether or not the mothers says that anyone in the household has been very sick or bedridden for a period of more than three months.

#### **12. 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 as measured by the following variables:

- 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

### **13. 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 as measured by the following variables:

- 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

### **14. Hygiene Practices**

No statistically-significant differences were found between mothers of PD and malnourished children concerning the mother or caregiver's hygiene practices as measured by the following variables:

- Number of hygiene practices the mother or caregiver regularly teaches her child
- Hygiene index of mother's or caregiver's practices
- 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 mother or caregiver disposed of the child's feces in a proper place the last time the child defecated
- Treatment of child's drinking water
- Whether or not the mother mentions proper water storage practices
- 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

***A statistically-significant difference was seen between mothers of PD and mothers of malnourished children concerning hygiene practice:***

h. 52% of the mothers of PD children names a proper area for where her child defecated vs. 28% of malnourished children (p=0.04)

### **15. Particular Nutrients**

No statistically-significant differences were found between mothers of PD and malnourished children concerning consumption of the following nutrients by children:

- $\beta$ -Carotene-rich foods
- 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

- Potassium rich foods
- Magnesium rich foods
- Foods rich in Lycopene, flavonoids or flavonols
- Copper-rich foods
- Phosphorous-rich foods
- High protein foods

***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.***

## **V. Implications Based on Results of LDM Study for Kenya**

Given these results, FH/Kenya discussed the findings and suggested the actions summarized on the following pages, and is considering integrating several educational messages and design changes in its Title II and other nutrition programs in the future.

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

Finding	Suggested Action	Suggested Educational Messages
Mothers of <i>malnourished</i> children were between 33% and 11 times more likely to hit or spank their child	<ul style="list-style-type: none"> <li>➤ Explore why mothers of malnourished children are more likely to do this.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Educate mothers on more appropriate discipline actions.</li> </ul>
PD children consumed on average 3.4 meals per day whereas malnourished children consumed 2.9 meals per day	<ul style="list-style-type: none"> <li>➤ Promote messages relating to this throughout the program</li> </ul>	<ul style="list-style-type: none"> <li>➤ Educate mothers on the necessity of 5 meals per day (including snacks) for young children</li> </ul>
Children who ate <b>kale</b> (Sukuma) the previous day were about six times less likely to be malnourished. Children who consumed <b>milk</b> the previous day were about four times less likely to be malnourished. Children who consumed <b>eggs</b> the previous day were about 14 times less likely to be malnourished.	<ul style="list-style-type: none"> <li>➤ 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.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Feeding your children more kale, eggs, and milk will help him or her to grow more rapidly.</li> </ul>
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	<ul style="list-style-type: none"> <li>➤ Investigate barriers to spending more time with children</li> <li>➤ Training workshop on this</li> <li>➤ Educate mothers on choice of food (local foods) that can be prepared in advance and used as main meals and <b>snacks</b> that meet nutritional needs.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Importance of maximizing mother's face-to-face time with young children during early development</li> <li>➤ Good feeding practices and child care (taught to older siblings and other care givers).</li> <li>➤ Importance of mother leaving food and detailed instructions on how and when to feed the child with care providers. Choosing reliable alternate care providers.</li> </ul>

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	<ul style="list-style-type: none"> <li>➤ Workshop on problem cause by hitting/spanking young children</li> <li>➤ Explore when and why children are hit/spanked</li> <li>➤ Spiritual basis of alternate discipline</li> </ul>	<ul style="list-style-type: none"> <li>➤ Alternate forms of discipline</li> </ul>
52% of mothers of PD children named a proper area for where their child defecated vs. 28% of malnourished children	<ul style="list-style-type: none"> <li>➤ FH should continue to focus on proper hygiene techniques</li> </ul>	<ul style="list-style-type: none"> <li>➤ Continue hygiene messages</li> <li>➤ Focus on "cat method" – digging a hole in the ground to dispose of waste (if latrine not available)</li> <li>➤ Worm infestation to children from this</li> <li>➤ Contamination of food → flies → diarrhea/ vomiting</li> <li>➤ Contamination of water pans → diarrhea</li> <li>➤ Spiritual basis for this (Deut 23:13-14)</li> </ul>
60% of all mothers believe that malnutrition is either not serious or a little bit serious	<ul style="list-style-type: none"> <li>➤ Educate mother that malnutrition can be deadly</li> <li>➤ Teach mother on the establishment of proper nutritional practices like completely emptying breasts during breastfeeding (and other PD behaviors)</li> </ul>	<ul style="list-style-type: none"> <li>➤ Malnutrition can be deadly: accounts for 40-50% of child deaths.</li> <li>➤ Malnutrition can be prevented by proper <u>nutrition</u> (including breastfeeding and other feeding practices) and <u>sanitation</u> to reduce infections.</li> </ul>
<i>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:</i>		
96% of the women interviewed said that it was okay for a man to hit a woman	<ul style="list-style-type: none"> <li>➤ Could work on decreasing through mother's groups / Care Groups and community groups in the future</li> </ul>	
39% of the women interviewed were depressed on half of the days of the week or more	<ul style="list-style-type: none"> <li>➤ 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.)</li> <li>➤ Could integrate this with mother's groups / Care Groups in the future.</li> </ul>	

Finding	Suggested Action	Suggested Educational Messages
<p>81% of the children tested were anemic, with 71% of them either moderately or severely anemic.</p>	<ul style="list-style-type: none"> <li>➤ Weekly iron supplementation of children.</li> <li>➤ Daily iron supplementation of pregnant and nursing women.</li> <li>➤ Demonstration of foods rich in Vitamin A and iron.</li> <li>➤ Semi-annual deworming of children using mebendazole or albendazole – without fail. Use match money if MOH does not have adequate doses.</li> <li>➤ Encourage use of insecticide treated nets, and early treatment for malaria when mother or child has a fever. (Follow IMCI protocols.)</li> </ul>	<ul style="list-style-type: none"> <li>➤ Prevention and treatment of malaria</li> <li>➤ Prevention and treatment of worms (including in pregnant women)</li> <li>➤ Use iron-rich foods and iron supplements during pregnancy</li> <li>➤ Pregnant women should stop drinking tea during pregnancy since it inhibits iron absorption.</li> <li>➤ Pregnant and nursing women should eat iron-rich foods such as organ meats and green leafy vegetables.</li> <li>➤ Pregnant and nursing mothers should eat iron-rich foods with foods that increase iron absorption – foods with Vitamin C.</li> <li>➤ Completely empty breasts during BF of child.</li> </ul>

## **VI. Statistically-Significant Findings - Bolivia**

Complete results that were not statistically significant are mentioned in **Annex E**. Statistically-significant findings and those that are probably significant ( $0.05 < p < 0.2$ ) are highlighted in the shaded boxes below.

### **1. *Demographics:***

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- child's age
- 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
- number of siblings

***Concerning demographics, other findings that were not statistically significant, but had a relatively low p-value ( $0.05 < p\text{-value} < 0.2$ ) and are most likely correlated with malnutrition were:***

- a. 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)

### **2. *Mother's Income-generating work***

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- Mother doing cash work in last 12m
- Mother deciding how to spend money
- Roof construction (proxy for SES)

### **3. *Child Feeding Practices***

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- Child (ever) breastfed
- Initiation of breastfeeding (in hours after birth)
- Giving pre-lacteal feeds
- Age at complete weaning
- Speed of weaning
- Exclusive breastfeeding to six months
- Bottle feeding (ever)
- Current bottle feeding
- Consumption of five or more daily feeds by child
- Consumption of at least one snack daily
- 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
- Amount of food eaten during pregnancy (self-report) compared with usual level of eating
- Complete emptying of breasts by mother during breastfeeding

- Iron supplements taken by mother during pregnancy and breastfeeding
- Encouraging non-hungry child to eat

**Concerning feeding practices, the following differences between PD and malnourished children were found to be statistically-significant:**

- b. 42.1% of mothers of PD children reported having food taboos while lactating compared to 4.8% of mothers of malnourished children ( $p=0.005$ ).
- c. 32% of mothers of PD children reported having food taboos during pregnancy compared to 0% of mothers of malnourished children ( $p=0.005$ ).

**Concerning feeding practices, the following differences between PD and malnourished children were found to be statistically-significant during the subsequent analysis:**

- d. 42% of PD children compared to 58% of malnourished children stopped breastfeeding early (before 18 months of age) ( $p=0.03$ ). The odds ratio for this variable was 1.91 ( $1.01 < OR < 3.63$ ).
- e. 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 ( $0.11 < OR < 1.05$ ).
- f. PD children consumed on average 2.6 snacks per day whereas malnourished children consumed on average 2.2 snacks per day ( $p=0.015$ ).
- g. 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 ( $p < 0.001$ ).

**Concerning feeding practices, other findings that were not statistically significant, but had a relatively low p-value ( $0.05 < p\text{-value} < 0.2$ ) and are probably correlated with malnutrition were:**

- h. 100% of mothers of PD children compared to 91% of mothers of malnourished children gave their children snacks ( $p=0.17$ ).
- i. 11% of mothers of PD children fed children food separate from the rest of the family, compared to 0% of mothers of malnourished children ( $p=0.13$ ).
- j. 32% of mothers of PD children ate more during pregnancy compared to 14% of mothers of malnourished children ( $p=0.19$ ).
- k. 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**

No statistically-significant differences were found between PD and malnourished children concerning the mother's diet during pregnancy or lactation as measured by the following variables:

- Mothers regularly adding fat to their own meals during pregnancy and lactation.
- Mother's consumption of B1-rich foods during breastfeeding
- Mother's consumption of B12-rich foods during breastfeeding

- Mother's consumption of zinc-rich foods during breastfeeding
- Mother's consumption of protein-rich foods during breastfeeding

***Concerning the mother's diet, the following differences between PD and malnourished children were found to be statistically-significant during the subsequent analysis:***

- l. 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 ( $0.98 < OR < 187.56$ ).
- m. 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 ( $1.17 < OR < 6.28$ ).
- n. 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 ( $1.08 < OR < 4.12$ ).

### **5. Specific Foods Consumed by the Child**

Interestingly, no statistically-significant differences were found between PD and malnourished children concerning the specific foods consumed by the child. (Quantities of food given to children may have varied, but no data on quantity of food given to the child was included in the survey given the logistical burden on collecting and analyzing that data.)

### **6. Child Care Practices**

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- 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
- 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

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

No statistically-significant differences were found between PD and malnourished children concerning the mother's healthcare seeking behavior and home management of sick children as measured by the following variables:

- Child ill during the past two weeks
- Child ill with ARI during the past two weeks
- Child ill with fever or malaria during the past two weeks
- Child ill with measles during the past year
- 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

**Concerning health care seeking practices, the following differences between mothers of PD and malnourished children were found to be statistically-significant during subsequent analysis:**

- o. 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 ( $0.21 < OR < 1.05$ ).
- p. 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 ( $0.16 < OR < 0.62$ ).
- q. 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**

No statistically-significant differences were found between PD and malnourished children concerning the mother's world view as measured by the following variables:

- 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

**Concerning the mother's worldview, other findings that were not statistically significant, but had a relatively low p-value ( $0.05 < p\text{-value} < 0.2$ ) and may be correlated with malnutrition were:**

- r. 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**

No statistically-significant differences were found between PD and malnourished children concerning the mother or caregiver's acceptance of – and responsiveness to – the child as measured by the following variables:

- Whether or not mothers wanted their pregnancy
- Whether or not the child was hit or spanked
- Average responsiveness score

**Concerning the mother's responsiveness to her child, the following differences between mothers of PD and malnourished children were found to be statistically-significant during subsequent analysis:**

- s. 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**

No statistically-significant differences were found between PD and malnourished children concerning the mother or caregiver's support network as measured by the following variables:

- Number of wives the mother's husband has

- Average social support score of mother (scale does not include caring for a family member with a chronic illness)
- Number of types of help mother receives from her family of origin over the past month
- Number of community activities mother has participated in over the past week
- Whether or not fathers contribute money to support the child
- Whether or not the mother has a female relative living in the same house or compound with her
- How often the mother of the child visits or talks with other friends or family outside of the household
- Whether or not the mother has someone in her family who live close by (whom she could count on to let her stay with them for a few nights)
- Whether or not the mother says that there is someone from her family of origin who lives close by who she could count on for financial help
- Whether or not the mothers says that anyone in the household has been very sick or bedridden for a period of more than three months

***Concerning a mother's support network, other findings that were not statistically significant, but had a relatively low p-value ( $0.05 < p\text{-value} < 0.2$ ) and are probably correlated with malnutrition were:***

- t. 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 as measured by the following variables:

- Mothers relationship to spouse (score)
- 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

***Concerning mother's relationship with husband, other findings that were not statistically significant, but had a relatively low p-value ( $0.05 < p\text{-value} < 0.2$ ) and may be correlated with malnutrition were:***

- u. 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 as measured by the following variables:

- 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

***Concerning symptoms of depression, other findings that were not statistically significant, but had a relatively low p-value ( $0.05 < p\text{-value} < 0.2$ ) and are probably correlated with malnutrition were:***

- v. 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**

No statistically-significant differences were found between mothers of PD and malnourished children concerning the mother or caregiver's hygiene practices as measured by the following variables:

- Number of hygiene practices the mother or caregiver regularly teaches her child
- 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
- Treatment of child's drinking water
- Whether or not the mother mentions proper water storage practices

***Concerning the mother's hygiene practices, the following differences between mothers of PD and malnourished children were found to be statistically-significant during subsequent analysis:***

- w. Mothers of PD children mention an average of 5.2 safe food handling practices vs. 4.2 for mothers of malnourished children ( $p=0.01$ ).
- x. Mothers of PD children have an average hygiene practices index score of 3.3 vs. 2.7 for mothers of malnourished children ( $p=0.02$ ).

## **14. Particular Nutrients**

No statistically-significant differences were found between mothers of PD and malnourished children concerning consumption of the following nutrients by children:

- 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
- Potassium rich foods
- Magnesium rich foods
- Foods rich in Lycopene, flavonoids or flavonols
- Copper-rich foods
- Phosphorous-rich foods
- High protein foods

***Concerning the consumption of food containing particular nutrients, findings that were found to be statistically significant during subsequent analysis:***

- y.  $\beta$ - Carotene-rich foods: PD children consumed beta-carotene rich foods an average of 11.6 times in a week vs. 9.3 times for malnourished children ( $p=0.046$ ).

**$\beta$ - 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.

## **VII. Implications Based on Results of LDM Study for Bolivia**

Given these results, FH/Bolivia discussed the findings and suggested the actions summarized on the following pages, and is considering integrating several educational messages and design changes in its Title II and other nutrition programs in the future.

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

Finding	Suggested Action	Suggested Educational Messages
Mothers of <u>PD children</u> are 14.6 times more likely to have food taboos when lactating	<ul style="list-style-type: none"> <li>➤ 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 <i>instead</i> of the taboo foods. Use this information to come up with better strategies of improving the diet of lactating women.</li> </ul>	<ul style="list-style-type: none"> <li>➤ If they are nutritious, promote the foods PD mothers are eating in place of taboo foods.</li> </ul>
Mothers of <u>PD children</u> are more likely to have food taboos while pregnant (32% of PD compared to 0% of malnourished)	<ul style="list-style-type: none"> <li>➤ 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 <i>instead</i> of the taboo foods. Use this information to come up with better strategies of improving the diet of lactating women.</li> </ul>	<ul style="list-style-type: none"> <li>➤ If they are nutritious, promote the foods PD mothers are eating in place of taboo foods.</li> </ul>
Mothers of PD children feed their children $\beta$ -Carotene-rich foods three times more frequently than mothers of malnourished children	<ul style="list-style-type: none"> <li>➤ Review food data to determine which <math>\beta</math>-Carotene foods are most accessible to mothers.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Promote these foods to mothers in communities.</li> </ul>
Mothers of PD children were more likely to give their children snacks (100% of PD vs. 91% of malnourished)	<ul style="list-style-type: none"> <li>➤ Investigate which snacks given to children. Find ones that are easy to prepare and help diversify the child's diet.</li> </ul>	<ul style="list-style-type: none"> <li>➤ 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.</li> </ul>

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 ( <a href="http://barrieranalysis.fhi.net">http://barrieranalysis.fhi.net</a> ) 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.
<i>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:</i>		
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.

## VIII. Statistically-Significant Findings - Ethiopia

Complete results that were not statistically significant are mentioned in **Annex F**. Statistically-significant findings are highlighted in the shaded boxes below.

### 1. *Demographics:*

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- 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
- number of siblings

***An expected statistically-significant difference was found between PD children and malnourished children regarding age:***

- a. 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*

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- Mother doing cash work in last 12m
- Mother deciding how to spend money
- Roof construction (proxy for SES)

### 3. *Child Feeding Practices*

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- Child (ever) breastfed
- Initiation of breastfeeding (in hours after birth)
- Giving pre-lacteal feeds
- Complete emptying of breasts by mother during breastfeeding
- Age at complete weaning
- Speed of weaning
- Exclusive breastfeeding to six months
- Introduction of solids in child's diet at 6-10m of age
- Bottle feeding (ever)
- Current bottle feeding
- Consumption of five or more daily feeds by child
- Consumption of at least one snack daily
- 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
- Mother having food taboos concerning foods she eats during pregnancy
- Amount of food eaten during pregnancy (self report) compared with usual level of eating
- Encouraging non-hungry child to eat
- Food density

**Concerning feeding practices, the following difference between PD and malnourished children was found to be statistically-significant:**

- b. 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.
- c. 61% of PD children and 84% of malnourished children stopped breastfeeding early (before 18 months of age). ( $p=0.009$ ,  $OR=3.39$ ,  $CI: 1.2<OR<9.8$ ).
- d. PD children consumed on average 3.0 meals per day whereas malnourished children consumed 2.7 meals per day ( $p=0.02$ ).
- e. 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 ( $p=0.009$ ,  $OR=0.34$ ,  $CI: 0.14<OR<0.85$ ).
- f. 39% of mothers of PD children compared to 18% of mothers of malnourished children took iron supplements during pregnancy ( $p=0.02$ ,  $OR=0.35$ ,  $CI: 0.12<OR<0.96$ ).
- g. 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 ( $p=0.02$ ).

#### **4. Foods Consumed by the Mother during pregnancy and lactation**

No statistically-significant differences were found between PD and malnourished children concerning the mother's diet during pregnancy or lactation as measured by the following variables:

- Mothers regularly adding fat to their food during pregnancy
- Mother's consumption of  $\beta$ -carotene foods during breastfeeding
- Mother's consumption of retinol-rich foods during breastfeeding
- Mother's consumption of B1-rich foods during breastfeeding
- Mother's consumption of B6-rich foods during breastfeeding
- Mother's consumption of B12-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

#### **5. Specific Foods Consumed by the Child**

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

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

## **6. Child Care Practices**

No statistically-significant differences were found between PD and malnourished children as measured by the following variables:

- 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
- 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
- Whether or not the child's milk teeth were removed
- Whether or not the child's uvula was removed

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

No statistically-significant differences were found between PD and malnourished children concerning the mother's healthcare seeking behavior and home management of sick children as measured by the following variables:

- Child ill during the past two weeks
- Child ill with diarrhea during the past two weeks
- Child ill with ARI during the past two weeks
- Child ill with fever or malaria during the past two weeks
- Child ill with measles during the past year
- 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
- Mother regularly uses iodized salt in the child's food

***Concerning health care seeking practices, the statistically-significant differences seen between mothers of PD and mothers of malnourished children were:***

- i. 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 ( $p=0.014$ ,  $OR=0.36$ ,  $CI: 0.14<OR<0.90$ ).

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

No statistically-significant differences were found between PD and malnourished children concerning the mother's world view as measured by the following variables:

- 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

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

No statistically-significant differences were found between PD and malnourished children concerning the mother or caregiver's acceptance of – and responsiveness to – the child as measured by the following variables:

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

**Concerning the mother's responsiveness to her child, the statistically-significant differences seen between mothers of PD and mothers of malnourished children were:**

j. 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 ( $p=0.04$ ).

### **10. Mother/Caregiver's Support Network**

No statistically-significant differences were found between PD and malnourished children concerning the mother or caregiver's support network as measured by the following variables:

- Number of wives the mother's husband has
- Average social support score of mother (scale does not include caring for a family member with a chronic illness)
- Number of community activities mother has participated in over the past week
- 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
- Whether or not the mothers says that anyone in the household has been very sick or bedridden for a period of more than three months

### **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 as measured by the following variables:

- Mothers relationship to spouse (score)
- 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

### **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 as measured by the following variables:

- 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

### **13. Hygiene Practices**

No statistically-significant differences were found between mothers of PD and malnourished children concerning the mother or caregiver's hygiene practices as measured by the following variables:

- Number of hygiene practices the mother or caregiver regularly teaches her child
- 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
- Treatment of child's drinking water
- Whether or not the mother mentions proper water storage practices
- Number of practices mother or caregiver mentions concerning safe food handling and preservation

***Concerning the mother's hygiene practices, the following differences between mothers of PD and malnourished children were found to be statistically-significant:***

k. 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).

l. A hygiene index was developed that examined mothers' hygiene practices. (0 is lowest possible and 7 is highest possible.) 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).

### **14. Particular Nutrients**

No statistically-significant differences were found between mothers of PD and malnourished children concerning consumption of the following nutrients by children:

- β-Carotene rich foods
- 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
- Potassium rich foods
- Magnesium rich foods
- Foods rich in Lycopene, flavonoids or flavonols
- Copper-rich foods
- Phosphorous-rich foods
- High protein foods

## **IX. Implications Based on Results of LDM Study for Ethiopia**

Given these results, FH/Ethiopia discussed the findings and suggested the actions summarized on the following pages, and is considering integrating several educational messages and design changes in its Title II and other nutrition programs in the future.

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

Finding	Suggested Action	Suggested Educational Messages
<p><b>Breastfeeding/Feeding</b></p> <ul style="list-style-type: none"> <li>● Malnourished children are 3.4 times more likely to stop breastfeeding early (&lt;18m). (61% PD vs. 84% Mal)</li> <li>● 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)</li> <li>● 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)</li> <li>● Malnourished children are 4 times more likely to be currently breastfeeding. (47% PD vs. 78% Mal)</li> </ul> <p>Older malnourished children are more likely to be currently breastfeeding. (mean age=33m)  &lt;33m 68% PD, 97% Mal  &gt;=33m 34% PD, 44% Mal</p>	<ul style="list-style-type: none"> <li>➤ Encourage continued breastfeeding (until at least 2 years).</li> <li>➤ Encourage increased frequency of feeding, including the use of snacks. Promote mothers feeding children three meals and two snacks daily.</li> <li>➤ Food fairs and cooking demonstrations to teach what food types are appropriate for children (consistency and texture) and how to feed children.</li> <li>➤ Training on income generation activities to improve livelihood of families and access to complementary foods.</li> <li>➤ Compliment mothers for breastfeeding malnourished children.</li> <li>➤ Promote certain crops in the local community or fortified food rations to use for complementary foods.</li> <li>➤ Ask mothers to avoid giving tea to their children, in order to enhance iron absorption.</li> <li>➤ Raise awareness level of mothers and fathers about appropriate breastfeeding and complementary feeding through health education on proper child nutrition.</li> </ul>	<ul style="list-style-type: none"> <li>➤ 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.</li> <li>➤ Messages for community members, including fathers and grandmothers, about continuing to breastfeed for at least two years and complementary feeding.</li> <li>➤ 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.</li> <li>➤ Nutritional value of important crops and fortified food rations that can be used to produce complementary foods.</li> <li>➤ 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.</li> </ul>

Finding	Suggested Action	Suggested Educational Messages
<p><b>Maternal Factors</b></p> <ul style="list-style-type: none"> <li>● Mothers of PD children were 2.9 times more likely to take iron supplements during pregnancy. (39% PD vs. 18% Mal)</li> </ul> <p>(*plus average months of iron supplementation during pregnancy was almost significant)</p> <ul style="list-style-type: none"> <li>● Mothers of PD children took iron supplements longer during lactation (PD average of 0.7 months vs. Mal average of 0.2 months)</li> </ul> <p>(*plus factors related to maternal nutrition during BF were almost significant)</p> <ul style="list-style-type: none"> <li>● 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)</li> </ul>	<ul style="list-style-type: none"> <li>➤ Increase awareness of mothers about the importance of iron during pregnancy and lactation.</li> <li>➤ Provide iron supplements.</li> <li>➤ Iron supplementation campaign for pregnant mothers and promotion of post-partum Vitamin A dosing. Advocacy for iron for lactating mothers.</li> <li>➤ Promote maternal nutrition and appropriate weight gain during the prenatal period.</li> <li>➤ 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).</li> <li>➤ Link nutrient supplementation campaign with child immunization campaign.</li> </ul>	<ul style="list-style-type: none"> <li>➤ Pregnant women need to take iron during their entire pregnancy to help their children grow and to avoid maternal anemia.</li> <li>➤ All women need a dose of vitamin A within 40 days of delivery. Take iron during lactation to help your child grow better.</li> <li>➤ Women who are pregnant need to eat more food than when they are not.</li> <li>➤ Blood lost during delivery can be replaced by getting iron supplements or iron containing foods.</li> </ul>

Finding	Suggested Action	Suggested Educational Messages
<p><b>Child Care/ Care Seeking</b></p> <ul style="list-style-type: none"> <li>● PD children are 2.8 times more likely to be dewormed. (52% PD vs. 28% Mal)</li> <li>● PD children are 5.9 times more likely to defecate in a proper spot (diaper or latrine). (35% PD vs. 8% Mal)</li> <li>● Average hygiene index for mothers (index based on good hygiene habits reported by mother) (PD = 2.61 vs. Mal = 2.06)</li> </ul> <p>(*plus average number of essential hygiene practices mothers taught to children almost significant)</p> <ul style="list-style-type: none"> <li>● Average number of days child is hit/spanked</li> </ul> <p>PD = 1.6 days Mal = 0.80 days</p> <p>(*plus getting hit/spanked was almost significant)</p>	<ul style="list-style-type: none"> <li>➤ Community mobilization of children 1-5y for deworming during UNICEF's Expanded Outreach posts every 6 months.</li> <li>➤ 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.</li> <li>➤ 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.</li> <li>➤ Encourage every household to have a latrine. Consider barrier analysis on this behavior.</li> <li>➤ Promote washing diapers in soapy water. Consider pursuing a soap-making initiative using local ash and intercommunity experience sharing.</li> <li>➤ If water is a problem limiting handwashing, introduce the "tippy tap" to conserve water.</li> <li>➤ Explore why PD children are more likely to be hit/spanked. Are there other positive child rearing practices (e.g., increased vigilance) confounding this?</li> </ul>	<ul style="list-style-type: none"> <li>➤ "Worms make children malnourished – deworm your children every 6 months."</li> <li>➤ "Handwashing with soap/ash is important to prevent worm infestation, diarrhea, and transmission of pneumonia."</li> <li>➤ Dispel myth that child's feces are safe and communicate safe disposal of stool in a latrine.</li> <li>➤ "Once a child starts to walk, they need shoes to prevent hookworms which suck out a child's blood."</li> <li>➤ "Every house should have a latrine and use it to help prevent disease transmission and help everyone to be healthy."</li> <li>➤ "Soap helps remove germs – Wash diapers with soap as well as water."</li> </ul>

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

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

**Matrix of Possible Localized Determinants of Malnutrition (Related to Intake/Illness History)**  
(Sorted by Total Score)

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

<sup>3</sup> 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 +++++.

<sup>4</sup> Possibility of affecting with an intervention within Title II

<sup>5</sup> Prevalence, geographical distribution

Possible Determinant	Strength of Association <sup>3</sup> / Severity of Problem	Feasibility of Measurement	Susceptibility to Change <sup>4</sup>	Scope of Problem <sup>5</sup>	Total Score
<b>23. Polyphenols: coffee, tea, &amp; cocoa</b> ( <i>iron uptake inhibitors</i> )	+++?	+++++	+++++	+++?	<b>16</b>
<b>24. Magnesium intake (child)</b>	+++?	+++++	+++++	++??	<b>15</b>
<b>25. Lycopene, flavonoids, &amp; flavonols intake (child)</b>	+++	++++	+++++	+++?	<b>15</b>
<b>26. Number of pregnancies, child spacing</b>	+++	++++	+++	+++++	<b>15</b>
<b>27. Potassium intake (child)</b>	+++?	+++++	+++++	++??	<b>15</b>
<b>28. Maternal B1, B6 &amp; B12 consumption during pregnancy or lactation</b>	+++++	++	+++	++++	<b>14</b>
<b>29. Vitamin A intake during pregnancy and lactation</b>	+++++	++	++++	+++	<b>14</b>
<b>30. Iron intake during pregnancy and lactation</b>	++++	++	+++	+++++	<b>14</b>
<b>31. Maternal consumption of fat during pregnancy and lactation</b>	++++	+	++++	++++	<b>13</b>
<b>32. Phytate to zinc (molar) ratio &amp; Phytate / Fiber (child)</b>	+++	++	++++	++++	<b>13</b>
<b>33. Copper intake (child)</b>	++??	++++	++++	+++?	<b>13</b>
<b>34. Mother's intake of protein during pregnancy and lactation</b>	+++?	++	+++	++++	<b>12</b>
<b>35. Phosphorous intake (child)</b>	++??	++++	++++	++??	<b>12</b>
<b>36. Vitamin B2 (Riboflavin) intake (child)</b>	- ?	++++	+++	++++	<b>11</b>
<b>37. Mother's intake of zinc during pregnancy or lactation</b>	++?	++	++	++++	<b>10</b>
<b>38. Calcium intake (child)</b>	+	++++	+++	++??	<b>10</b>
<b>39. Vitamin E (Tocopherol) intake (child)</b>	-	++++	++++	++?	<b>10</b>
<b>40. Age breastfeeding terminated / Length of breastfeeding</b>	-	+++++	+	++++	<b>10</b>
<b>41. Vitamin C intake (child)</b>	-	++++	++++	+?	<b>9</b>
<b>42. Threonine, lysine, &amp; methionine intake (child)</b>	+?	-	++	++++?	<b>8</b>
<b>43. Food taboos for child</b>	++?	++	+++	++??	<b>8</b>
<b>44. Mothers dietary taboos</b>	++?	++	+++	++??	<b>8</b>
<b>45. Exposure to sunlight to generate Vitamin D (child)</b>	-	++	++++	+?	<b>8</b>
<b>46. Maternal illness history</b>	-	+++	+?	++?	<b>6</b>
<b>47. Cooking methods and vitamin preservation</b>	+?	-	+	+?	<b>2</b>

**Matrix of Possible Localized Determinants of Malnutrition (Related to Intake/Illness History)**  
*(Sorted by strength of association)*

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

<sup>6</sup> 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 +++++.

<sup>7</sup> Possibility of affecting with an intervention within Title II

<sup>8</sup> Prevalence, geographical distribution

Possible Determinant	Strength of Association <sup>6</sup> / Severity of Problem	Feasibility of Measurement	Susceptibility to Change <sup>7</sup>	Scope of Problem <sup>8</sup>
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

<p><b>(PUT CHILD'S NUMBER AT TOP OF EACH PAGE)</b></p> <p><b>TRIAGE PERSON ONLY: Fill in the box at right →</b></p> <p><b>Name of Child:</b> _____</p> <p><b>Age of child in <u>completed months</u>:</b> _____</p> <p><b>Child's Cultural/Language Group:</b> _____</p> <p><b>Child's gender:</b> _____</p> <p><b>Name of Mother/Caregiver:</b> _____</p> <p><b>Mother/Caregiver's Age:</b> _____ years</p> <p><b>Mother/Caregiver's relationship to child's father:</b></p> <p><input type="checkbox"/> 1. Father lives with Mother/Caregiver      <input type="checkbox"/> 4. Father is known, but lives elsewhere</p> <p><input type="checkbox"/> 2. Father is dead      <input type="checkbox"/> 5. Mother/Caregiver and father divorced</p> <p><input type="checkbox"/> 3. Father is not known      <input type="checkbox"/> 6. Other</p> <p><b>Mother/Caregivers marital status:</b></p> <p><input type="checkbox"/> 1. Married to or living with one person monogamously      <input type="checkbox"/> 2. Polygamous relationship</p> <p><input type="checkbox"/> 3. Widowed      <input type="checkbox"/> 4. Divorced      <input type="checkbox"/> 5. Other (Specify: _____)</p> <p><b>Household type:</b> <input type="checkbox"/> 1. Child lives with nuclear family only    <input type="checkbox"/> 2. Child is orphan    <input type="checkbox"/> 3. Child lives with extended family<sup>9</sup></p> <p><b>How many children born before this child:</b> ____    <b>How many preschool children in house:</b> ____</p>	<p><b>TRIAGE: CHECK EACH THAT IS <u>TRUE</u></b></p> <p><input type="checkbox"/> Mother has more than one child</p> <p><input type="checkbox"/> Mother does not have a child malnourished 0-59m of age</p> <p><input type="checkbox"/> Mother does not have a severe or atypical social or health situation.</p> <p><input type="checkbox"/> Child is between 12 and 59m of age.</p> <p><input type="checkbox"/> Child is not sick.</p> <p><input type="checkbox"/> Child is not losing weight currently for more than two months consecutively.</p> <p><input type="checkbox"/> Mother is not well to do</p>
<p><input type="checkbox"/> <b>PD Child -- Weight</b> ____ . ____ kg</p> <p><input type="checkbox"/> <b>Malnourished Child -- Weight</b> ____ . ____ kg</p> <p><input type="checkbox"/> <b>Neither PD nor malnourished – Thank the Mother/Caregiver and end the interview.</b></p>	

### *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

<sup>9</sup> 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.)
- | <i>Yes</i>               | <i>No</i>                |  |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | a. ( <i>â-Carotene foods</i> :) 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 |
| <input type="checkbox"/> | <input type="checkbox"/> | b. ( <i>Retinol foods</i> :) Liver, kidney, [other organ meats including giblets], red palm oil, cod liver oil, tuna, margarine, butter, or cheese   |
| <input type="checkbox"/> | <input type="checkbox"/> | c. ( <i>B1 [Thiamin] foods</i> ): Rice bran, sesame meal/seeds, sunflower seeds, cottonseed meal/flour, wheat germ, tahini, or sweet potato.   |
| <input type="checkbox"/> | <input type="checkbox"/> | d. ( <i>B6 [Pyridoxine] foods</i> ): Rice or wheat bran, pistachio nuts, liver, garlic, safflower seeds, or saltwater fish.  |
| <input type="checkbox"/> | <input type="checkbox"/> | e. ( <i>B12 foods</i> :) Crustaceans, organ meats <sup>10</sup> , fish, red meat, or cheese  |
| <input type="checkbox"/> | <input type="checkbox"/> | f. ( <i>Zinc foods</i> :) Red meat, crab, organ meats, nuts, cowpeas, or adzuki beans  |
| <input type="checkbox"/> | <input type="checkbox"/> | g. ( <i>Protein foods</i> :) 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

<sup>10</sup> 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:]

<i>On how many days during the past week did (NAME) have...</i>	<i>Number of Days the child ate this food:</i>
1. ...hot peppers <sup>11</sup> ?	
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?	

<i>On how many days during the past week did (NAME) have...</i>	<i>Number of Days the child ate this food:</i>
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?	

<sup>11</sup> 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<sup>12</sup> or not iodized?  
 1. Iodized       2. Not iodized       3. Don't know

#### IV. World View<sup>13</sup>

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.

<sup>12</sup> 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.

<sup>13</sup> 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<sup>14</sup> 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.)			
<i>Sometimes a husband is annoyed or angered by things which his wife does. In your opinion, is a husband <u>justified</u> in hitting or beating his wife/partner in the following situations:</i>	<b>YES</b>	<b>NO</b>	<b>Don't Know</b>

<sup>14</sup> 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.*)

<i>Circle the appropriate cell after reading the question below</i>	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	
				<b>Total Score:</b>	

### **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!**

## Annex C

### Results that Were NOT Statistically Significant - Mozambique

Sample size for this study was small, so we were unlikely to capture all of the meaningful differences between the two groups. For the following variables, no statistically-significant differences were found between positive deviant (PD) and malnourished children in the FH/Mozambique expanded PD study:

#### 1. **Demographics:**

***None of the following relationships were found to be significant in this field trial.*** It should be kept in mind that a small sample size (n=54) was used for this field test, so few differences found would be expected to be statistically significant. Significant relationships are shown in blue font throughout this document.

- a. Stunted children in the study had an average age of 33.7 months. PD children had an average age of 27.8 months (p=0.09).
- b. Of mothers who spoke Ndaou as their principal language, 29% were positive deviants (PD). Of mothers who spoke Sena, 48% were PDs.
- c. 52% of PD children were male and 48% were female.
- d. Average age of mothers of PD children was 33 years vs. 30 years for mothers of malnourished children.
- e. No relationship was found between PD and whether or not the father was alive and living with the mother.
- f. No relationship was found between PD and current marital status.
- g. No relationship was found between PD and family type (child living with nuclear family vs. child orphaned or living with extended family).
- h. No relationship was found between PD and number of siblings.
- i. Only 62% of mothers had both their height and weight registered, so BMI was not examined.

#### 2. **Mother's Income-generating work**

***None of the following relationships were found to be significant.***

- a. 25% PD mothers did cash work in last 12m. 48% of mothers of malnourished did. [ns]
- b. 83% of PD mothers decided (solo or jointly with husband) how to spend their money. 59% of mothers of malnourished did so. [ns]
- c. No relationship was found between PD and roof construction (proxy for SES).

#### 3. **Child Feeding Practices**

- a. Almost all mothers (of PD and malnourished children) had breastfed their child at some point. [ns]

- b. Mothers of PD children starting breastfeeding their children at 4.6 hours after delivery on average. Mothers of malnourished children started breastfeeding at 8.5 hours after delivery on average. [ns]
- c. 14% of mothers of PD children gave their children prelacteal feeds. 26% of mothers of malnourished children did so. [ns]
- d. Children who were PDs were completely weaned at 19.6 months on average. Children who were stunted were completely weaned at 21 months on average. [ns]
- e. 25% of PD children were weaned slowly (rather than abruptly) vs. 20% of malnourished children. [ns]
- f. 67% of PD children were exclusively breastfed to six months vs. 60% of malnourished children. [ns]
- g. Almost all mothers ate  $\beta$ -carotene foods during breastfeeding.
- h. 85% of mothers of PD children vs. 84% of mothers of malnourished children ate retinol-rich foods during breastfeeding. [ns]
- i. 70% of mothers of PD children vs. 81% of mothers of malnourished children ate B1 (thiamine) rich foods during breastfeeding. [ns]
- j. 94% of all mothers ate B6 (pyridoxine) rich foods during breastfeeding.
- k. 94% of all mothers ate B12 rich foods during breastfeeding.
- l. 85% of mothers of PD children vs. 97% of mothers of malnourished children ate zinc-rich foods during breastfeeding. [ns]
- m. 75% of mothers of PD children vs. 100% of mothers of malnourished children ate protein-rich foods during breastfeeding. [ns]
- n. 89% of mothers of PD children regularly added fat to their own meals vs. 83% of mothers of malnourished children. [ns]
- o. 72% received solid foods at 6-10m of age vs. 65% of malnourished children. [ns]
- p. 71% of PD children were bottle fed at some point vs. 47% of malnourished children. [ns]
- q. 71% of PD children were currently being bottlefed vs. 38% of malnourished children. [ns]
- r. 94% of PD children consumed five or more daily feeds vs. 93% of malnourished children. [ns]
- s. 86% of PD children normally consumed at least one snack daily vs. 94% of malnourished children. [ns]
- t. 81% of PD children eat from a common plate vs. 71% of malnourished children. [ns]
- u. 33% of PD children eat the same foods as the rest of the family vs. 13% of malnourished children. [ns]
- v. 32% of PD children are fed by neighbors vs. 39% of malnourished children. [ns]
- w. 71% of mothers of PD children vs. 90% of mothers of malnourished children have food taboos (i.e., they believe that there are some foods that a child should never eat). [ns]

- x. 90% of mothers of PD and malnourished children believed there were certain foods that they should avoid when breastfeeding.
- y. 70% of PD mothers believe there are foods that should not be eaten during pregnancy vs. 84% of mothers of malnourished children. [ns; p=0.07]
- z. 20% of PD mothers said they ate more than usual during pregnancy vs. 38% of mothers of malnourished children. [ns]
- aa. 76% of mothers of PD children said their child was average or larger than average at birth vs. 65% of mothers of malnourished children. [ns]

#### **4. Foods Consumed by Mother During Pregnancy**

- a. Almost all mothers consumed  $\beta$ -carotene foods during pregnancy.
- b. 91% of mothers of PD children consumed retinol-rich foods during pregnancy (“usually...at least one or more times per week”) vs. 77% of mothers of malnourished children. [ns]
- c. 76% of mothers of PD children consumed B1 rich foods during pregnancy vs. 87% of mothers of malnourished children. [ns]
- d. 95% of mothers of PD children consumed B6 rich foods during pregnancy vs. 87% of mothers of malnourished children. [ns]
- e. 71% of mothers of PD children consumed B12 rich foods during pregnancy vs. 84% of mothers of malnourished children. [ns]
- f. 86% of mothers of PD children consumed zinc rich foods during pregnancy vs. 90% of mothers of malnourished children. [ns]
- g. 86% of mothers of PD children consumed protein rich foods during pregnancy vs. 94% of mothers of malnourished children. [ns]
- h. Almost all mothers regularly added fat to their food during pregnancy.

#### **5. Specific Foods Consumed by the Child**

Mothers were asked about their child’s consumption of 81 foods. 74 of those foods were not found to be statistically related to PD status. (See body of report and the questionnaire).

#### **6. Child Care Practices**

- a. 54% of mothers of PD children always take their child with them when outside the home vs. 72% of mothers of malnourished children. [ns]
- b. The average age at which Mothers of PD children left their children home with someone else was 10.2 months vs. 11.69 months for malnourished children. [ns]
- c. The average hours for which PD children were away from their mothers each day was 1.8 hours vs. 3.27 hours for malnourished children. [ns]
- d. No relationship was seen between PD status and who took care of the child during the day.
- e. 78% of mothers of PD children gave feeding advice to other caregivers vs. 92% of mothers of malnourished children. [ns]
- f. 90% of mothers of PD children left food for their child when they went out vs. 82% of mothers of malnourished children. [ns]

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

- a. 57% of PD children were ill during the past two weeks vs. 58% of malnourished children. [ns]
- b. 10% of PD children were ill with respiratory illness during the past two weeks vs. 3% of malnourished children. [ns]
- c. 45% of PD children were ill with fever or malaria during the past two weeks vs. 32% of malnourished children. [ns]
- d. 10% of PD children were ill with measles during the past year vs. 6.5% of malnourished children. [ns]
- e. 70% of mothers of PD children sought help for illness the last time their child was ill vs. 90% of mothers of malnourished children. [ns; p=0.065]
- f. 6% of mothers of PD children sought help for their child's illness the same or next day vs. 17% of mothers of malnourished children. [ns]
- g. All mothers who sought care for their sick child claimed to have sought care from a trainer person (Socorrista, Promoter, Nurse, Doctor, etc.).
- h. 31% of mothers of PD children gave their child the same or more food during their last illness vs. 81% of mothers of malnourished children. [ns]
- i. 19% of mothers of PD children had and used ITBNs vs. 10% of mothers of malnourished children. [ns]
- j. 37% of PD children had been dewormed in the past six months vs. 41% of malnourished children. [ns]
- k. 30% of mothers of PD children said they regularly used iodized salt in their child's food vs. 40% of malnourished children. [ns]

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

- a. 45% of mothers of PD children believed that neighbors or other persons can make her child become malnourished, or mentions other "magic" causes vs. 37% of malnourished children. [ns]
- b. 20% of mothers of PD children believed that "a a neighbor or another person in your community make a child lose weight by something that they do (e.g., curses, evil eye)" vs. 27% of malnourished children. [ns]
- c. 50% of mothers of PD children believed that malnutrition was a serious problem vs. 53% of mothers of malnourished children. [ns]

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

- a. Mothers of PD children had an average responsiveness score of 3.38 vs. a score of 3.97 for mothers of malnourished children. [ns; p=0.07] The responsiveness score was based on how the mother was observed to speak to and touch her child during a period of supervised interaction.
- b. 72% of mothers of PD children touched their child often during the supervised session vs. 83% of mothers of malnourished children. [ns] There was no correlation found between PD and a mother speaking gently to her child.

- c. 25% of mothers of PD children said that they knew their child was hungry when they asked for food, pointed, or used gestures vs. 39% of mothers of malnourished children. [ns] (Question was open-ended. Other responses included “cries” or “other”).
- d. 84% of mothers of PD children said that they usually responded to their child’s demands for attention when they were doing housework vs. 87% of mothers of malnourished children. [ns]
- e. Almost all mothers said that their child had pleased them “somewhat” or “very much” during the past month. [ns]
- f. 27% of mothers of PD children corrected them appropriately (telling “no”, having child sit/quiet time, putting things out of reach, distracting, or picking up to comfort) vs. 45% of mothers of malnourished children. [ns] (Other responses were ignoring, limiting movement, slapping, hitting or spanking, and others.)
- g. 55% of mothers of PD children wanted their pregnancy (with the PD child) vs. 73% of mothers of malnourished children. [ns]

#### **10. Stimulation Given to Child**

- a. PD children had on average 2.6 types of toys that they played with vs. an average of 2.3 for malnourished children. [ns]
- b. PD children had on average 11.6 learning events in the past week vs. an average of 20.8 events for malnourished children. [ns; p=0.11]
- c. Fathers of PD children were involved with their child on average 6.2 days per week (given a list of specific tasks – see questionnaire) vs. an average of 5.8 days for malnourished children. [ns]
- d. PD children had an average social stimulation score of 1.1 vs. an average of 1.2 for malnourished children. [ns] (See questionnaire for items in scale.)

#### **11. Mother/Caregiver’s Support Network**

- a. Mothers of PD children received on average 1.86 types of help from her family of origin in the past month vs. an average of 2.5 for mothers of malnourished children. [ns]
- b. Mothers of PD children participate on average in 1.84 types of community activities in the past week vs. an average of 2.7 activities for mothers of malnourished children. [ns]
- c. Mothers of PD children had an average social support score of 3.62 vs. an average score of 4.3 for mothers of malnourished children. This social support score did not include caring for a family member with a chronic illness. [ns]
- d. 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.
- e. 75% of fathers of PD and malnourished children (same percentage for both) contributed money to support the child (e.g., paying for food or clothing).
- f. 40% of mothers of PD children had a female adult relative living in the same house or compound with them vs. 33% of mothers of malnourished children. [ns]

- g. 54% of mothers of PD children visits or talks with other friends or family outside of the household several times per day or per week vs. 55% of mothers of malnourished children. [ns]
- h. 45% of mothers of PD children had someone in their family of origin who lives close by (whom she could count on to let her stay with them for a few nights) vs. 53% of mothers of malnourished children. [ns]
- i. 47% of mothers of PD children said that there was someone from their family of origin who lived close by who they could count on for financial help vs. 36% for mothers of malnourished children. [ns]

## **12. *Mother/Caregiver's Relationship with Husband/Partner***

- a. A score was used to determine the mother's relationship with her spouse (1 = Poor; 4 = Excellent). Mothers of PD children had an average relationship score with husband of 2.19 vs. an average score of 2.24 for mothers of malnourished children. [ns]
- b. We examined the percentage of mothers who said that they were mostly or completely satisfied with their relationship with their husband. 42% of mothers of PD children said that they were mostly or completely satisfied vs. 45% of mothers of malnourished children.
- c. Mothers were given six specific situations and asked during which of the situations was it okay for a husband to hit or beat his wife (as a proxy for spousal abuse). Mothers of PD children mentioned 1.6 times on average when it was okay for a man to hit or beat his wife. Mothers of PD children mentioned 2.4 times on average when it was okay for a man to hit or beat his wife. [ns] The percentages for both groups were as follows:
  - If she goes out to do something without telling him: 38.8% (PD=55.6%)
  - If she neglects the children: 38.8% (PD=22.2%)
  - If she argues with him: 53.1% (PD = 55.6%)
  - If she refuses to sleep with him or have sex with him: 28.6% (PD=11.1%)
  - If she burns the food: 28.6% (PD=11.1%)
  - Any other reason: 23.3% (PD=6.7%)
- d. We examined the percentage of mothers who said that they were mostly or completely satisfied with their relationship with their husband. 42% of mothers of PD children said that they were mostly or completely satisfied vs. 45% of mothers of malnourished children.
- e. Only one mother (out of both groups) said that she quarreled with their husband three or more times per week.
- f. 42% of mothers of PD children said that someone in their family needs to cut their alcohol consumption vs. 33% of mothers of malnourished children. [ns]

## **13. *Mother/caregiver's Self-report of Depressive Symptoms***

- a. We used a six item instrument to calculate to what degree mothers had signs of depression. (Higher score = more depressed.) Mothers of PD children had an average score of 8.37 vs. an average score of 9.97 for mothers of malnourished children. [ns; p=0.12]
- b. According to their remarks on these questions, all mothers
  - Felt sad three or more times per week: 15.4%
  - Felt lonely three or more times per week: 25.5%
  - Had crying spells three or more times per week: 17.7%

- Did not enjoy life three or more times per week: 48.1%
  - Felt depressed three or more times per week: 29.4%
  - Felt little interest or pleasure in doing things three or more times per week: 23.5%
- c. 43% mothers of PD children said that they felt depressed on half or more days of the week vs. 35% of mothers of malnourished children. [ns]

#### 14. *Hygiene Practices*

- a. Mothers were asked which hygiene practices they regularly teach to their child. Mothers of PD children mentioned 6.9 practices on average vs. 7.5 practices mentioned by mothers of malnourished children. (Total possible = 14.) [ns]
- b. A hygiene index was developed that examined mothers' hygiene practices. (0 is lowest possible and 7 is highest possible.) Mothers of PD children had an average hygiene index of 3.57 vs. an average of 3.15 for mothers of malnourished children. [ns]
- c. 94% of all mothers claimed to have used soap or ashes in the past day or previous day for cleaning or washing.
- d. Mothers were asked when (during the current or previous day) they washed their hands with soap or ashes. Mothers of PD children mentioned 2.86 times on average when they did so vs. 2.88 times mentioned by mothers of malnourished children. [ns]
- e. 25% of mothers of PD children mentioned proper places when asked where their child defecated the last time vs. 19% of mothers of malnourished children. [ns]
- f. When asked where they disposed of their child's feces the last time they defecated, 75% of mothers of PD children mentioned a proper spot vs. 67% of mothers of malnourished children. [ns]
- g. When asked about storage and coverage of water containers in the home, 86% of mothers of PD children mentioned proper water storage practices vs. 87% of mothers of malnourished children. [ns]
- h. Mothers were asked how they remove water from water containers in the home. 86% of mothers of PD children said that they either poured the water (including use of containers with spigots or taps) or dipped out the water (using a receptacle/cup with a handle so that the hand does not come in contact with the water). 90% of mothers of malnourished children did so. [ns]
- i. Mothers were asked of any practices that they use to keep food safe to eat. All but one mother mentioned at least one proper practice. Mothers claimed to be doing on average 6.3 (of 11 possible) good practices. Mothers of PD children claimed to be doing an average 5.9 proper food handling practices vs. an average of 6.4 practices for mothers of malnourished children. [ns]

#### 15. *Particular Nutrients*

- a. ***β-Carotene-rich foods:*** PD children consumed β-Carotene foods on average 17.6 times per week vs. 16.1 times per week for malnourished children. [ns]
- b. ***Retinol-rich foods:*** PD children consumed retinol-rich foods on average 2.85 times per week vs. 1.58 times per week for malnourished children. [ns]
- c. ***Iodine foods:*** PD children consumed iodine-rich foods on average 1.56 times per week vs. 2.12 times per week for malnourished children. [ns]

- d. **High-fat foods:** PD children consumed high-fat foods on average 1.72 times per week vs. 2.4 times per week for malnourished children. [ns]
- e. **Foods rich in Inhibitors:** PD children consumed foods with inhibitors on average 2.9 times per week vs. 2.3 times per week for malnourished children. [ns]
- f. **Iron-rich foods:** PD children consumed iron-rich foods on average 8.2 times per week vs. 5.1 times per week for malnourished children. [ns]
- g. **Zinc-rich foods:** PD children consumed zinc-rich foods on average 6.4 times per week vs. 5.2 times per week for malnourished children. [ns]
- h. **Phytate-rich foods:** PD children consumed -rich foods on average 8.8 times per week vs. 6.4 times per week for malnourished children. [ns]
- i. **B12-rich foods:** PD children consumed B12-rich foods on average 4.3 times per week vs. 2.2 times per week for malnourished children. [ns]
- j. **Foods rich in Lycopene, flavonoids or flavonols:** PD children consumed lycopene-, flavonoids-, and flavonol-rich foods on average 14.5 times per week vs. 11.45 times per week for malnourished children. [ns]
- k. **Copper-rich foods:** PD children consumed copper-rich foods on average 24.0 times per week vs. 12.3 times per week for malnourished children. [ns; p=0.31]
- l. **Phosphorous-rich foods:** PD children consumed phosphorous-rich foods on average 4.9 times per week vs. 3.1 times per week for malnourished children. [ns]
- m. **High protein foods:** PD children consumed -rich foods on average times per week vs. times per week for malnourished children. [ns]
- n. PD children were more likely to have consumed foods rich in B12, copper, retinol, B2, iron, phosphorous, magnesium, potassium, lycopene. (Not all of these differences were significant.) They were less likely to have consumed foods rich in iodine and fat. [ns]

## Annex D

### Results that Were NOT Statistically Significant - Kenya

For the following variables, no statistically-significant differences were found between positive deviant (PD) and malnourished children in the FH/Kenya expanded PD study:

#### 1. **Demographics:**

**None of the following relationships were found to be significant in this field trial.** A sample size of n=101 was used for this field test, 26 PD children and 76 malnourished children.

- a. Of mothers who spoke Borana as their principal language, 29.5% were positive deviants (PD). Of mothers who spoke Rendille, 35.3% were PDs. Of mothers who spoke Samburu, 6.3% were PD (OR = 6.25 [CI: 0.86-274], p=0.04 (Fisher exact, 1 tailed). **Mothers who spoke Samburu as their principal language were 6.25 times more likely to have a malnourished child.**
- b. 50% of PD children were male and 50% were female. 45% of malnourished children were females and 55% of malnourished children were males [ns.]
- c. Average age of mothers of PD children was 27 years vs. 29 years for mothers of malnourished children.
- d. No relationship was found between PD and whether or not the father was alive and living with the mother.
- e. No relationship was found between PD and current marital status.
- f. No relationship was found between PD and family type (child living with nuclear family vs. child orphaned or living with extended family).
- g. No relationship was found between PD and number of siblings.

#### 2. **Mother's Income-generating work**

**None of the following relationships were found to be significant.**

- a. 27% PD mothers did cash work in last 12m. 23% of mothers of malnourished did. [ns]
- b. No relationship was found between PD and roof construction (proxy for SES).

#### 3. **Child Feeding Practices**

- a. Almost all mothers (of PD and malnourished children) had breastfed their child at some point. [ns]
- b. Both mothers of PD children and mothers of malnourished children initiated breastfeeding, on average, 4 hours after delivery (4.2 and 4.3 hours respectively).
- c. 36% of mothers of PD children gave their children prelacteal feeds. 32% of mothers of malnourished children did so. [ns]
- d. Children who were PDs were completely weaned at 22.9 months on average. Children who were malnourished were completely weaned at 17 months on average. [ns]
- e. 40% of PD children were weaned slowly (rather than abruptly) vs. 15% of malnourished children. [ns]

- f. 19% of PD children were exclusively breastfed to six months vs. 12% of malnourished children. [ns]
- g. 77% mothers or PD children vs. 74% ate  $\beta$ -carotene foods during breastfeeding. [ns]
- h. 62% of mothers of PD children vs. 58% of mothers of malnourished children ate retinol-rich foods during breastfeeding. [ns]
- i. 92% of mothers of PD children vs. 82% of mothers of malnourished children ate B1 (thiamine) rich foods during breastfeeding. [ns]
- j. 92% of mothers of PD children vs. 81% of mothers of malnourished children ate B6 (pyridoxine) rich foods during breastfeeding. [ns]
- k. 19% of mothers of PD children vs. 24% of mothers of malnourished children ate B12 rich foods during breastfeeding. [ns]
- l. 58% of mothers of PD children vs. 70% of mothers of malnourished children ate zinc-rich foods during breastfeeding. [ns]
- m. 81% of mothers of PD children vs. 85% of mothers of malnourished children ate protein-rich foods during breastfeeding. [ns]
- n. 68% of mothers of PD and 61% of mothers of malnourished children did not take any iron supplements during pregnancy
- o. 73% of mothers of PD children regularly added fat to their own meals vs. 59% of mothers of malnourished children. [ns]
- p. 63% of all children (PD and malnourished) received solid foods at 6-10m of age.
- q. 46% of PD children were bottle fed at some point vs. 55% of malnourished children. [ns]
- r. 27% of PD children were currently being bottlefed vs. 22% of malnourished children. [ns]
- s. 76% of PD children consumed five or more daily feeds vs. 83% of malnourished children. [ns]
- t. 58% of PD children normally consumed at least one snack daily vs. 51% of malnourished children. [ns]
- u. 27% of PD children eat from a common plate vs. 15% of malnourished children. [ns]
- v. 54% of PD children eat the same foods as the rest of the family vs. 61% of malnourished children. [ns]
- w. 27% of mothers of PC children encouraged their non-hungry child to eat vs. 36% of malnourished children
- x. 77% of mothers of PD children vs. 61% of mothers of malnourished children have food taboos (i.e., they believe that there are some foods that a child should never eat). [ns]
- y. 69% of mothers of PD children vs. 57% of mother malnourished children believed there were certain foods that they should avoid when breastfeeding.
- z. 69% of PD mothers believe there are foods that should not be eaten during pregnancy vs. 60% of mothers of malnourished children. [ns]
- aa. 100% of PD mothers said they ate more than usual during pregnancy vs. 97% of mothers of malnourished children. [ns]

- bb. 92% of mothers of PD children said their child was average or larger than average at birth vs. 73% of mothers of malnourished children. [ns]

#### **4. Specific Foods Consumed by the Child**

Mothers were asked about their child's consumption of 81 foods. None of those foods were found to be statistically related to PD status. (See the questionnaire).

#### **5. Child Care Practices**

- g. 15% of mothers of PD children always take their child with them when outside the home vs. 25% of mothers of malnourished children. [ns]
- h. The average age at which all mothers (those of both PD and malnourished children) left their children home with someone else was 5.6 months.
- i. The average hours for which PD children were away from their mothers each day was 5 hours vs. 6.7 hours for malnourished children. [ns]
- j. No relationship was seen between PD status and who took care of the child during the day.
- k. 100% of all mothers (those of PD children and malnourished children) gave feeding advice to other caregivers.
- l. 92% of mothers of PD children left food for their child when they went out vs. 97% of mothers of malnourished children. [ns]

#### **6. Healthcare Seeking Behavior and Home Management of Sick Children**

- l. 54% of PD children were ill during the past two weeks vs. 52% of malnourished children. [ns]
- m. 12% of PD children were ill with diarrhea during the past two weeks vs. 10% of malnourished children. [ns]
- n. 24% of PD children were ill with respiratory illness during the past two weeks vs. 14% of malnourished children. [ns]
- o. 20% of PD children were ill with fever or malaria during the past two weeks vs. 27% of malnourished children. [ns]
- p. 13% of PD children were ill with measles during the past year vs. 18% of malnourished children. [ns]
- q. 87% of mothers of PD children sought help for illness the last time their child was ill vs. 90% of mothers of malnourished children. [ns; p=0.065]
- r. 62% of mothers of PD children sought help for their child's illness the same or next day vs. 53% of mothers of malnourished children. [ns]
- s. All mothers of PD children vs. 90% of mothers of malnourished children who sought care for their sick child claimed to have sought care from a trained person (Socorrista, Promoter, Nurse, Doctor, etc.).
- t. 8% of mothers of PD children gave their child the same or more food during their last illness vs. 18% of mothers of malnourished children. [ns]
- u. In the study, **only one** mother of a PD child reported using an insecticide treated bed net the night before the study.

- v. 46% of PD children had been dewormed in the past six months vs. 55% of malnourished children. [ns]
- w. 100% of mothers of PD children said they regularly used iodized salt in their child's food vs. 98% of malnourished children. [ns]

### **7. Mother's (or Caregiver's) World View**

- d. 73% of mothers of PD children believed that neighbors or other persons can make her child become malnourished, or mentions other "magic" causes vs. 67% of malnourished children. [ns]
- e. 58% of mothers of PD children believed that a neighbor or another person in your community make a child lose weight by something that they do (e.g., curses, evil eye)" vs. 63% of malnourished children. [ns]
- f. 31% of mothers of PD children believed that malnutrition was a serious problem vs. 43% of mothers of malnourished children. [ns]

### **8. Mother/caregiver's Acceptance of (and Responsiveness to) Child**

- h. Mothers of PD children had an average responsiveness score of 2.23 vs. a score of 2.45 for mothers of malnourished children. [ns] The responsiveness score was based on how the mother was observed to speak to and touch her child during a period of supervised interaction.
- i. Almost all mothers said that their child had pleased them "somewhat" or "very much" during the past month. [ns]
- j. 88% of mothers of PD children wanted their pregnancy (with the PD child) vs. 81% of mothers of malnourished children. [ns]

### **9. Mother/Caregiver's Support Network**

- j. Mothers of PD children participate on average in 0.54 types of community health activities in the past week vs. an average of 1.42 health activities for mothers of malnourished children. [ns]
- k. Mothers of PD children had an average social support score of 3.08 vs. an average score of 3.13 for mothers of malnourished children. [ns]
- l. 81% of fathers of PD children vs. 79% of father of malnourished children contributed money to support the child (e.g., paying for food or clothing). [ns]
- m. 12% of mothers of PD children had a female adult relative living in the same house or compound with them vs. 8% of mothers of malnourished children. [ns]
- n. 35% of mothers of PD children visits or talks with other friends or family outside of the household several times per day or per week vs. 27% of mothers of malnourished children. [ns]
- o. 46% of mothers of PD children had someone in their family of origin who lives close by (whom she could count on to let her stay with them for a few nights) vs. 54% of mothers of malnourished children. [ns]
- p. 46% of mothers of PD children said that there was someone from their family of origin who lived close by who they could count on for financial help vs. 48% for mothers of malnourished children. [ns]

### **10. Mother/Caregiver's Relationship with Husband/Partner**

- g. A score was used to determine the mother's relationship with her spouse (1 = Poor; 4 = Excellent). Mothers of PD children had an average relationship score with husband of 2.31 vs. an average score of 2.29 for mothers of malnourished children. [ns]
- h. We examined the percentage of mothers who said that they were mostly or completely satisfied with their relationship with their husband. 82% of mothers of PD children said that they were mostly or completely satisfied vs. 79% of mothers of malnourished children.
  - Mothers were given six specific situations and asked during which of the situations was it okay for a husband to hit or beat his wife (as a proxy for spousal abuse). Mothers of PD children mentioned 3.72 times on average when it was okay for a man to hit or beat his wife. Mothers of PD children mentioned 4.123 times on average when it was okay for a man to hit or beat his wife. [ns]
- i. We examined the percentage of mothers who said that they were mostly or completely satisfied with their relationship with their husband. 82% of mothers of PD children said that they were mostly or completely satisfied vs. 79% of mothers of malnourished children.
- j. All mothers (of both PD and malnourished children) had an average relationship score of 2.3.
- k. No mothers of PD children said that she quarreled with their husband three or more times per week vs. 5% of mothers of malnourished children. [ns]
- l. 13% of mothers of PD children said that someone in their family needs to cut their alcohol consumption vs. 16% of mothers of malnourished children. [ns]

### **11. Mother/caregiver's Self-report of Depressive Symptoms**

- d. We used a six item instrument to calculate to what degree mothers had signs of depression. (Higher score = more depressed.) Mothers of PD children had an average score of 9.65 vs. an average score of 9.89 for mothers of malnourished children. [ns]
- e. According to their remarks on these questions, all mothers
  - Felt sad three or more times per week: 23%
  - Felt lonely three or more times per week: 15%
  - Had crying spells three or more times per week: 10%
  - Did not enjoy life three or more times per week: 30%
  - Felt depressed three or more times per week: 15%
  - Felt little interest or pleasure in doing things three or more times per week: 23%
- f. About 39% of all mothers (both PD and malnourished children) said that they felt depressed on half or more days of the week vs. 38% of mothers of malnourished children. [ns]

### **12. Hygiene Practices**

- j. Mothers were asked which hygiene practices they regularly teach to their child. Mothers of PD children mentioned 4.89 practices on average vs. 5.23 practices mentioned by mothers of malnourished children. (Total possible = 14.) [ns]
- k. A hygiene index was developed that examined mothers' hygiene practices. (0 is lowest possible and 7 is highest possible.) Mothers of PD children had an average hygiene index of 3.58 vs. an average of 3.21 for mothers of malnourished children. [ns]

- l. 84% of all mothers claimed to have used soap or ashes in the past day or previous day for cleaning or washing. (No significant differences between PD and malnourished.)
- m. Mothers were asked when (during the current or previous day) they washed their hands with soap or ashes. Mothers of PD children mentioned 2.77 times on average when they did so vs. 2.55 times mentioned by mothers of malnourished children. [ns]
- n. 52% of mothers of PD children mentioned proper places when asked where their child defecated the last time vs. 28% of mothers of malnourished children. [ns]
- o. When asked where they disposed of their child's feces the last time they defecated, 52.4% of mothers of PD children mentioned a proper spot vs. 27.7% of mothers of malnourished children. [ns] (OR = 0.35 [CI: 0.11-1.08], p = 0.04). **Mothers who claimed to dispose of their child's feces in a proper spot were 2.9 times more likely to have a PD child.**
- p. When asked about storage and coverage of water containers in the home, 96% of mothers of PD children mentioned proper water storage practices vs. 93% of mothers of malnourished children. [ns]
- q. 54% of mother of PD children used a water treatment method vs. 56 of mothers of malnourished children. [ns]
- r. Mothers were asked of any practices that they use to keep food safe to eat. All mothers mentioned at least one proper practice. Mothers claimed to be doing on average 5 (of 11 possible) good practices. Mothers of PD children claimed to be doing an average 5.15 proper food handling practices vs. an average of 5.08 practices for mothers of malnourished children. [ns]

### 13. Particular Nutrients

- o. ***β-Carotene-rich foods:*** PD children consumed β-Carotene foods on average 5.6 times per week vs. 3.7 times per week for malnourished children. [ns]
- p. ***Retinol-rich foods:*** PD children consumed retinol-rich foods on average 0.77 times per week vs. 0.87 times per week for malnourished children. [ns]
- q. ***Iodine foods:*** PD children consumed iodine-rich foods on average 4.61 times per week vs. 4.23 times per week for malnourished children. [ns]
- r. ***High-fat foods:*** PD children consumed high-fat foods on average 1.85 times per week vs. 1.97 times per week for malnourished children. [ns]
- s. ***Foods rich in Inhibitors:*** PD children consumed foods with inhibitors on average 5.89 times per week vs. 6.41 times per week for malnourished children. [ns]
- t. ***Iron-rich foods:*** PD children consumed iron-rich foods on average 5.73 times per week vs. 4.85 times per week for malnourished children. [ns]
- u. ***Legumes:*** PD children consumed legumes on average 3.85 times per week vs. 2.88 times per week for malnourished children. [ns]
- v. ***Zinc-rich foods:*** PD children consumed zinc-rich foods on average 1.39 times per week vs. 1.49 times per week for malnourished children. [ns]
- w. ***Phytate-rich foods:*** PD children consumed -rich foods on average 4.12 times per week vs. 2.94 times per week for malnourished children. [ns]

- x. **B12-rich foods:** PD children consumed B12-rich foods on average 0.50 times per week vs. 0.61 times per week for malnourished children. [ns]
- y. **Foods rich in Lycopene, flavonoids or flavonols:** PD children consumed lycopene-, flavonoid-, and flavonol-rich foods on average 4.19 times per week vs. 3.08 times per week for malnourished children. [ns]
- z. **Potassium-rich foods:** PD children consumed potassium-rich foods on average 8.58 times per week vs. 6.56 times per week for malnourished children. [ns]
- aa. **Copper-rich foods:** PD children consumed copper-rich foods on average 7.58 times per week vs. 6.45 times per week for malnourished children. [ns]
- bb. **Phosphorous-rich foods:** PD children consumed phosphorous-rich foods on average 3.27 times per week vs. 2.45 times per week for malnourished children. [ns]
- cc. **B2-rich foods:** PD children consumed B2-rich foods on average 4.15 times per week vs. 3.90 times per week for malnourished children. [ns]
- dd. **High protein foods:** PD children consumed high-protein foods on average 6.2 times per week vs. 5.4 times per week for malnourished children [ns, p = 0.48]

## Annex E

### Results that Were NOT Statistically Significant – Bolivia

The initial sample size for this study was small (n=40), so we were unlikely to capture all of the meaningful differences between the two groups. A larger sample was collected by conducting more interviews in November 2007, and the data set was analyzed revealing subsequent significant findings. For the following variables, no statistically-significant differences were found between positive deviant (PD) and malnourished children in the subsequent FH/Bolivia expanded PD study:

#### 1. **Demographics:**

**None of the following relationships were found to be significant in this study.** A sample size of n=181 was used for this field test, 95 PD children and 86 malnourished children.

- a. Malnourished children in the study had an average age of 24.6 months. PD children had an average age of 26.3 months. [ns]
- b. 93% of the mothers spoke Quechua as their principal language and 5% of the mothers spoke Aymara.
- c. 59% of the children were male and 41% were female.
- d. Average age of mothers of PD children was 30.4 years vs. 31.0 years for mothers of malnourished children. [ns]
- e. No relationship was found between PD and whether or not the father was alive and living with the mother. 90.4% of PD children and 92.8% of malnourished children had a father alive and living with mother. [ns]
- f. No relationship was found between PD and current marital status.
- g. No relationship was found between PD and family type (child living with nuclear family vs. child orphaned or living with extended family).
- h. No relationship was found between PD and number of siblings.

#### 2. **Mother's Income-generating work**

**None of the following relationships were found to be significant.**

- a. 21.1% of PD mothers did cash work in last 12m. 14.1% of mothers of malnourished did. [ns]
- b. No relationship was found between PD and roof construction (proxy for SES).

#### 3. **Child Feeding Practices**

- a. 98% of PD mothers and 95% of mothers of malnourished children had breastfed their child at some point. [ns]
- b. Mothers of PD children started breastfeeding their children at 1.6 hours after delivery on average. Mothers of malnourished children started breastfeeding at 3.5 hours after delivery on average. [ns]

- c. 15.2% of mothers of PD children gave their children prelacteal feeds. 15.8% of mothers of malnourished children did so. [ns]
- d. Children who were PDs were completely weaned at 18.9 months on average. Children who were malnourished were completely weaned at 17.1 months on average. [ns]
- e. 34.7% of PD children were currently breastfeeding. 48.2% of malnourished children were. [ns]
- f. 91.3% of PD children and 89.3% of malnourished children usually completely emptied their mother's breasts when breastfeeding. [ns]
- g. 37.7% of PD children were weaned slowly (rather than abruptly in 1 week or less) vs. 35.7% of malnourished children. [ns]
- h. 85.1% of PD children and 77.6% of malnourished children were introduced to solid foods after 5 months of age. [ns]
- i. The average month at which children were first introduced to any liquids or foods other than breastmilk was 5.5 for PD children and 5.4 for malnourished children. [ns]
- j. 85.1% of PD children were exclusively breastfed to six months vs. 77.6% of malnourished children. [ns]
- k. The average age for the introduction of solid foods was 5.9 months for both PD and malnourished children. [ns]
- l. 29.8% of PD children were bottle fed at some point vs. 30.5% of malnourished children. [ns]
- m. 10% of PD children were currently being bottlefed vs. 9.8% of malnourished children. [ns]
- n. 92.3% of PD children consumed five or more daily feeds vs. 85.7% of malnourished children. [ns]
- o. 96.8% of PD children and 97.7% of malnourished children were given snacks on a daily basis. [ns]
- p. Average number of meals was 3.15 for PD children and 2.98 for malnourished children. [ns]
- q. 30.9% of PD children eat from a common plate vs. 24.7% of malnourished children. [ns]
- r. 96.8% of PD children eat the same foods as the rest of the family vs. 95.3% of malnourished children. [ns]
- s. 46.8% of mothers of PD children and 42.4% of malnourished children encouraged their non-hungry child to eat. [ns]
- t. The average food diversity score for PD children was 7.08 vs. a food diversity score of 6.55 for malnourished children.
- u. 29.3% of mothers of PD children vs. 31.3% of mothers of malnourished children have food taboos (i.e., they believe that there are some foods that a child should never eat). [ns]
- v. 16.9% of mothers of PD children vs. 21.7% of mothers of malnourished children have food taboos for when she is breastfeeding. [ns]

- w. 16.5% of both mothers of PD and malnourished children have food taboos for when they are pregnant. [ns]

#### **4. Foods Consumed by Mother During Pregnancy and Lactation**

- a. 61.7% of mothers of PD children vs. 51.8% of mothers of malnourished children ate B1 (thiamine) rich foods during breastfeeding. [ns]
- b. 76.3% of mothers of PD children vs. 72.6% of mothers of malnourished children ate B12 rich foods during breastfeeding. [ns]
- c. 58.9% of mothers of PD children vs. 60.2% of mothers of malnourished children ate zinc-rich foods during breastfeeding. [ns]
- d. 97.9% of mothers of PD children vs. 97.6% of mothers of malnourished children ate protein-rich foods during breastfeeding. [ns]
- e. 85.1% of mothers of PD children regularly added fat to their own meals vs. 75.6% of mothers of malnourished children while breastfeeding. [ns]
- f. 80.9% of mothers of PD children and 76.7% of mothers of malnourished children added fat to their diet during pregnancy. [ns]
- g. The average number of months that mothers took iron supplements during breastfeeding was 1.02 for mothers of PD children and 1.01 for mothers of malnourished children. [ns]
- h. 80.9% of mothers of PD children and 73.3% of mothers of malnourished children reported taking iron supplements while pregnant. The average number of months that the supplement was taken was 2.13 for mothers of PD children and 2.22 for mothers of malnourished children. [ns]
- i. 25.3% of mothers of PD children and 14.1% of mothers of malnourished children reported eating more during pregnancy. [p=0.06, almost significant]

#### **5. Specific Foods Consumed by the Child**

Mothers were asked about their child's consumption of 88 foods. All of those foods were not found to be statistically related to PD status. (See body of report and the questionnaire).

#### **6. Child Care Practices**

- a. 51.6% of mothers of PD children always take their child with them when outside the home vs. 59.3% of mothers of malnourished children. [ns]
- b. The average age at which Mothers of PD children left their children home with someone else was 16.1 months vs. 14.5 months for malnourished children. [ns]
- c. The average hours for which PD children were away from their mothers each day was 2.44 hours vs. 2.01 hours for malnourished children. [ns]
- d. 98% of mothers of PD children gave feeding advice to other caregivers vs. 95.3% of mothers of malnourished children. [ns]
- e. 85.7% of mothers of PD children left food for other caregivers to give children vs. 83.3% of mothers of malnourished children. [ns]

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

- a. 36.8% of PD children were ill during the past two weeks vs. 47.7% of malnourished children. [ns]
- b. 22.1% of PD children were ill with respiratory illness during the past two weeks vs. 16.3% of malnourished children. [ns]
- c. 2.1% of PD children were ill with fever or malaria during the past two weeks vs. 4.7% of malnourished children. [ns]
- d. 1.1% of PD children were ill with measles during the past year vs. 3.6% of malnourished children. [ns]
- e. 1.1% of PD children were ill with another illness during the last two weeks vs. 3.5% of malnourished children [ns].
- f. 72.3% of mothers of PD children sought help for illness the last time their child was ill vs. 63.8% of mothers of malnourished children. [ns]
- g. 59.1% of mothers of PD children sought help for their child's illness the same or next day vs. 45.5% of mothers of malnourished children. [ns]
- h. 92.5% of mothers of PD children who sought care for their sick child claimed to have sought care from a trained person vs. 83.6% of malnourished mothers. (Socorrista, Promoter, Nurse, Doctor, etc.).[ns]
- i. 43.5% of mothers of PD children gave their child the same or more food during their last illness vs. 48.1% of mothers of malnourished children. [ns]

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

- a. 28.7% of mothers of PD children mentioned other "magic" causes of malnutrition vs. 22.9% of mothers of malnourished children. [ns]
- b. 19.1% of mothers of PD children believe a person in their community can make a child lose weight by something they do (e.g. curses, evil eye) vs. 25.9% of mothers of malnourished children. [ns]
- c. 79.8% of mothers of PD children believed that malnutrition was a serious problem vs. 83.7% of mothers of malnourished children. [ns]

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

- a. The average response score for mothers of PD children was 1.43 and was 1.30 for mothers of malnourished children. [ns]
- b. 26.6% of PD children were spanked vs. 33.7% of malnourished children. PD children were spanked an average of 0.39 days a week and malnourished children 0.52 days. [ns]
- c. 26.6% of mothers of PD children wanted their pregnancy (with the PD child) vs. 17.6% of mothers of malnourished children. [ns]

### **10. Mother/Caregiver's Support Network**

- a. Mothers of PD children participate on average in 2.83 types of community health activities in the past week vs. an average of 2.45 activities for mothers of malnourished children. [ns]

- b. Mothers of PD children had an average social support score of 4.27 vs. an average score of 3.97 for mothers of malnourished children. This social support score did not include caring for a family member with a chronic illness. [ns]
- c. 77.9% of fathers of PD children and 71.4% of fathers of malnourished children contributed money to support the child (e.g., paying for food or clothing). [ns]
- d. 26.3% of mothers of PD children had a female adult relative living in the same house or compound with them vs. 24.4% of mothers of malnourished children. [ns]
- e. 51.6% of mothers of PD children visits or talks with other friends or family outside of the household several times per day or per week vs. 54.1% of mothers of malnourished children. [ns]
- f. 56.4% of mothers of PD children said that there was someone from their family of origin who lived close by who they could stay with for a couple of days vs. 50.6% for mothers of malnourished children. [ns]
- g. 54.3% of mothers of PD children said that there was someone from their family of origin who lived close by who they could count on for financial help vs. 47.7% for mothers of malnourished children. [ns]
- h. 6.4% of mothers of PD children and 15.1% of mothers of malnourished children reported having a member of the family sick for longer than 3 months in the last year. [ns]
- i. 2.2% of mothers of PD children and 5.2% of mothers of malnourished children reported having a family members between the ages of 15-49 that was sick or had died.[ns]

### ***11.Mother/Caregiver’s Relationship with Husband/Partner***

- a. A score was used to determine the mother’s relationship with her spouse (0 = Poor; 4 = Excellent). Mothers of PD children had an average relationship score with husband of 2.21 vs. an average score of 2.06 for mothers of malnourished children. [ns]
- b. We examined the percentage of mothers who said that they were mostly or completely satisfied with their relationship with their husband. 62.5% of mothers of PD children said that they were mostly or completely satisfied vs. 53.7% of mothers of malnourished children.[ns]
- c. 2.3% of mothers and fathers/partners of PD children quarreled frequently (3 or more times per week) vs. 5.1% of those of malnourished children. [ns]
- c. Mothers were given six specific situations and asked during which of the situations was it okay for a husband to hit or beat his wife (as a proxy for spousal abuse). Mothers of PD children mentioned 1.73 times on average when it was okay for a man to hit or beat his wife. Mothers of malnourished children mentioned 1.59 times on average when it was okay for a man to hit or beat his wife. [ns] The percentages for both groups were as follows:
  - If she goes out to do something without telling him: 27.6%
  - If she neglects the children: 40%
  - If she argues with him: 37.6%
  - If she refuses to sleep with him or have sex with him: 22.2%
  - If she burns the food: 27.9%
  - Any other reason: 18.6%
- d. 53% of mothers of PD children said that someone in their family needs to cut their alcohol consumption vs. 66.2% of mothers of malnourished children. [ns]

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

- a. We used a six item instrument to calculate to what degree mothers had signs of depression. (Higher score = more depressed.) Mothers of PD children had an average score of 10.08 vs. an average score of 10.76 for mothers of malnourished children. [ns]
- b. According to their remarks on these questions, all mothers
  - Felt sad three or more days per week: 11.7%
  - Felt lonely three or more days per week: 7.3%
  - Had crying spells three or more days per week: 7.2%
  - Did enjoy life three or more days per week: 38.5%
  - Felt depressed three or more days per week: 9.9%
  - Felt little interest or pleasure in doing things three or more days per week: 14.0%
- c. 57% mothers of PD children said that they felt depressed on half or more days of the week vs. 65.5% of mothers of malnourished children. [ns]

### **13. Hygiene Practices**

- a. Mothers were asked which hygiene practices they regularly teach to their child. Mothers of PD children mentioned 4.13 practices on average vs. 3.55 practices mentioned by mothers of malnourished children. (Total possible = 14.) [ns]
- b. Mothers of PD children reported washing hands with soap or ashes at an average of 3.2 critical times vs. 2.9 critical times for mothers of malnourished children. [ns]
- c. 18.8% of mothers of PD children mentioned proper places (e.g. latrine, diapers) when asked where their child defecated the last time vs. 20.5% of mothers of malnourished children. [ns]
- d. When asked about storage and coverage of water containers in the home, 35.1% of mothers of PD children mentioned covering water in the household vs. 29.1% of mothers of malnourished children. [ns]
- e. 73.7% of mothers of PD children and 64.0% of mothers of malnourished children reported using any water treatment method.[ns]
- f. 71.6% of mothers of PD children reported using water purification and vs. 64.0% of mothers of malnourished children. [ns]
- g. 97.9% of mothers of PD children and 97.7% of mothers of malnourished children reported doing any safe food handling practices.[ns]

### **14. Particular Nutrients**

- a. **Retinol-rich foods:** PD children and malnourished children consumed retinol-rich foods on average 0 times per week. [ns]
- b. **Iodine foods:** PD children consumed iodine-rich foods on average 5.24 times per week vs. 4.99 times per week for malnourished children. [ns]
- c. **High-fat foods:** PD children consumed high-fat foods on average 5.75 times per week vs. 6.37 times per week for malnourished children. [ns]
- d. **Foods rich in Inhibitors:** PD children consumed foods with inhibitors on average 4.01 times per week vs. 4.07 times per week for malnourished children. [ns]
- e. **Iron-rich foods:** PD children consumed iron-rich foods on average 23.89 times per week vs. 21.67 times per week for malnourished children. [ns]

- f. **Zinc-rich foods:** PD children consumed zinc-rich foods on average 2.00 times per week vs. 1.72 times per week for malnourished children. [ns]
- g. **Legumes:** PD children consumed legumes on average 11.96 times per week vs. 11.19 times per week for malnourished children. [ns]
- h. **Phytate-rich foods:** PD children consumed phytate-rich foods on average 3.16 times per week vs. 3.02 times per week for malnourished children. [ns]
- i. **B12-rich foods:** PD children consumed B12-rich foods on average 3.81 times per week vs. 3.47 times per week for malnourished children. [ns]
- j. **Foods rich in Lycopene, flavonoids or flavonols:** PD children consumed lycopene-, flavonoid-, and flavonol-rich foods on average 3.44 times per week vs. 3.31 times per week for malnourished children. [ns]
- k. **Foods rich in Potassium:** PD children consumed potassium-rich foods on average 24.82 times per week vs. 26.60 times per week for malnourished children. [ns]
- l. **Copper-rich foods:** PD children consumed copper-rich foods on average 9.36 times per week vs. 8.49 times per week for malnourished children. [ns]
- m. **Phosphorous-rich foods:** PD children consumed phosphorous-rich foods on average 1.61 times per week vs. 1.44 times per week for malnourished children. [ns]
- n. **Foods rich in B2 (riboflavin):** PD children consumed B2-rich foods on average 4.25 times per week vs. 4.20 times per week for malnourished children. [ns]
- o. **High protein foods:** PD children consumed -rich foods on average 12.99 times per week vs. 12.40 times per week for malnourished children. [ns]
- p. **Cruciferous foods:** PD children consumed cruciferous foods on average 0.46 times per week vs. 0.32 times per week for malnourished children. [ns]
- q. **Foods rich sulfur/chromium:** PD children consumed sulfur/chromium-rich foods on average 7.08 times per week vs. 6.23 times per week for malnourished children. [ns]

## Annex F

### Results that Were NOT Statistically Significant – Ethiopia

For the following variables, no statistically-significant differences were found between positive deviant (PD) and malnourished children in the FH/Ethiopia expanded PD study:

#### 1. Demographics:

***None of the following relationships were found to be significant in this study.***

A sample size of n=101 was used for this field test, 51 PD children and 50 malnourished children.

- a. 100% of the mothers spoke Amharic as their principal language [ns]
- b. Average age of mothers of PD children was 32.02 years vs. 30.31 years for mothers of malnourished children. [ns] There was no statistically significant difference between younger or older mothers (less than or greater than 25 years) in regards to the likelihood of having PD children.
- c. No relationship was found between PD and whether or not the father was alive and living with the mother. 84% of PD children and 88% of malnourished children had a father alive and living with mother. [ns]
- d. No relationship was found between PD and current marital status.
- e. No relationship was found between PD and family type (child living with nuclear family vs. child orphaned or living with extended family).
- f. No relationship was found between PD and number of siblings.

#### 2. Mother's Income-generating work

***None of the following relationships were found to be significant.***

- a. 51% of PD mothers did cash work in last 12m. 49% of mothers of malnourished did. [ns]
- b. The relationship between PD and roof construction (proxy for SES) was almost significant (OR=0.44, CI: 0.18<OR<1.08), p=0.04).

#### 3. Child Feeding Practices

- a. 94% of PD mothers and 98% of mothers of malnourished children breastfed their child at some point. [ns]
- b. Mothers of PD children started breastfeeding their children at 15.3 hours after delivery on average. Mothers of malnourished children started breastfeeding at 20.04 hours after delivery on average. [ns]
- c. 29.2% of mothers of PD children gave their children prelacteal feeds. 34.7% of mothers of malnourished children did so. [ns]
- d. Children who were PDs were completely weaned at 24.8 months on average. Children who were malnourished were completely weaned at 24.1 months on average. [ns]

- e. 55.3% of PD children completely emptied breasts when breastfeeding. 65.3% of malnourished children did. [ns]
- f. 53.8% of PD children were weaned slowly (rather than abruptly) vs. 54.5% of malnourished children. [ns]
- g. 80% of PD children and 87.5% of malnourished children were introduced to solid foods after 5 months of age. [ns]
- h. 80% of PD children were exclusively breastfed to six months vs. 87.5% of malnourished children. [ns]
- i. 60% of mothers of PD children and 61.2% of mothers of malnourished children introduced solids foods and at the proper time (6-10 months). [ns]
- j. The average age for the introduction of solid foods was 9.1 months for PD children and 8.1 months for malnourished children. [ns]
- k. 13.7% of PD children were bottle fed at some point vs. 6.4% of malnourished children. [ns]
- l. 2% of PD children and malnourished children were currently being bottlefed. [ns]
- m. 72.3% of PD children consumed five or more daily feeds vs. 82% of malnourished children. [ns]
- n. 58.8% of PD children and 44% of malnourished children were given snacks on a daily basis. [ns]
- o. Average number of snacks was 1.26 for PD children and 0.82 for malnourished children ( $p=0.13$ ). [ns]
- p. 22% of PD children eat from a common plate vs. 23.4% of malnourished children. [ns]
- q. 75.5% of PD children eat the same foods as the rest of the family vs. 78.7% of malnourished children. [ns]
- r. 49% of mothers of PD children and 46.9% of malnourished children encouraged their non-hungry child to eat. [ns]
- s. 91% of all mothers fed a thick, mashed, or solid texture to their children.
- t. 11.8% of mothers of PD children vs. 10% of mothers of malnourished children have food taboos (i.e., they believe that there are some foods that a child should never eat). [ns]

#### ***4. Foods Consumed by Mother During Pregnancy***

- a. 44.7% of mothers of PD children vs. 41.7% of mothers of malnourished children ate retinol-rich foods during breastfeeding. [ns]
- b. 51.1% of mothers of PD children vs. 31.3% of mothers of malnourished children ate B1 (thiamine) rich foods during breastfeeding. [ns]
- c. 80.9% of mothers of PD children vs. 83.7% of mothers of malnourished children ate B6 (pyridoxine) rich foods during breastfeeding. [ns]

- d. 67.4% of mothers of PD children vs. 57.1% of mothers of malnourished children ate B12 rich foods during breastfeeding. [ns]
- e. 72.3% of mothers of PD children vs. 55.1% of mothers of malnourished children ate zinc-rich foods during breastfeeding. [ns]
- f. 89.5% of mothers of PD children vs. 74.4% of mothers of malnourished children ate protein-rich foods during breastfeeding. [ns]
- g. 70% of mothers of PD children regularly added fat to their own meals vs. 64% of mothers of malnourished children while breastfeeding. [ns]
- h. 47.1% of mothers of PD children and 46% of mothers of malnourished children added fat to their diet during pregnancy. [ns]
- i. The average number of months that the iron supplement was taken while pregnant was 0.96 for mothers of PD children and 0.44 for mothers of malnourished children. [ns]

### **5. Specific Foods Consumed by the Child**

Mothers were asked about their child's consumption of 53 foods. All of those foods were not found to be statistically related to PD status. (See body of report and the questionnaire).

### **6. Child Care Practices**

- a. 17.6% of mothers of PD children always take their child with them when outside the home vs. 26% of mothers of malnourished children. [ns]
- b. The average age at which Mothers of PD children left their children home with someone else was 13.6 months vs. 13.8 months for malnourished children. [ns]
- c. The average hours for which PD and malnourished children were away from their mothers each day was 3.6 hours. [ns]
- d. 93.3% of mothers of PD children gave feeding advice to other caregivers vs. 97.6% of mothers of malnourished children. [ns]
- e. 33% of mothers of PD children vs. 45% of mothers of malnourished children had their child's "milk teeth" removed. [ns]
- f. 5.6% of mothers of PD children vs. 2.7% of mothers of malnourished children had their child's uvula removed. [ns]

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

- a. 31.4% of PD children were ill during the past two weeks vs. 44% of malnourished children. [ns]
- b. 7.8% of PD children were ill during the past two weeks with diarrhea vs. 22% of malnourished children. [ns]
- c. 13.7% of PD children were ill with respiratory illness during the past two weeks vs. 12.2% of malnourished children. [ns]
- d. 5.9% of PD children were ill with fever or malaria during the past two weeks vs. 8.2% of malnourished children. [ns]
- e. 0% of PD children were ill with measles during the past year vs. 2.7% of malnourished children. [ns]

- f. 3.9% of PD children were ill with another illness during the last two weeks vs. 4.1% of malnourished children [ns].
- g. 69.2% of mothers of PD children sought help for illness the last time their child was ill vs. 62.2% of mothers of malnourished children. [ns]
- h. 53.8% of mothers of PD and malnourished children sought help for their child's illness the same or next day. [ns]
- i. 89.3% of mothers of PD children who sought care for their sick child claimed to have sought care from a trained person vs. 92.6% of malnourished mothers. (Promoter, Nurse, Doctor, etc.).[ns]
- j. 40% of mothers of PD children gave their child the same or more food during their last illness vs. 34.9% of mothers of malnourished children. [ns]
- k. Most of the mothers of PD and malnourished children did not know what iodized salt was.

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

- a. 39.2% of mothers of PD children mentioned other "magic" causes of malnutrition vs. 42% of malnourished children. [ns]
- b. 27.5% of mothers of PD children believe that a neighbor can cause a child to lose weight vs. 46% of mothers of malnourished children. [ns]
- c. 86% of mothers of PD children believed that malnutrition was a serious problem vs. 80% of mothers of malnourished children. [ns]

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

- a. The average response score for mothers of PD children was 1.75 and was 1.46 for mothers of malnourished children. [ns]
- b. 76% of mothers of PD children said that their child had pleased them "somewhat" or "very much" during the past month vs. 69.4% of mothers of malnourished children. [ns]
- c. 50% of PD children were spanked vs. 30% of malnourished children. [ns]
- d. 56.5% of mothers of PD children wanted their pregnancy (with the PD child) vs. 49% of mothers of malnourished children. [ns]

### **10. *Mother/Caregiver's Support Network***

- a. Mothers of PD children and malnourished children participated on average in 0.5 community health activities in the past 3 months.
- b. Mothers of PD children had an average social support score of 1.73 vs. an average score of 1.60 for mothers of malnourished children. This social support score did not include caring for a family member with a chronic illness. [ns]
- c. 41.3% of fathers of PD children and 36.0% of fathers of malnourished children contributed money to support the child (e.g., paying for food or clothing). [ns]
- d. 28% of mothers of PD children visits or talks with other friends or family outside of the household several times per day or per week vs. 22% of mothers of malnourished children. [ns]

- e. 10% of mothers of PD children and malnourished children reported having a member of the family sick for longer than 3 months in the last year.
- f. 6.3% of mothers of PD children and 0% of mothers of malnourished children reported having a family members between the ages of 15-49 that was sick or had died.[ns]

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

- a. A score was used to determine the mother's relationship with her spouse (0 = Poor; 4 = Excellent). Mothers of PD children had an average relationship score with husband of 2.08 vs. an average score of 2.10 for mothers of malnourished children. [ns]
- b. We examined the percentage of mothers who said that they were mostly or completely satisfied with their relationship with their husband. 40% of mothers of PD children said that they were mostly or completely satisfied vs. 39.1% of mothers of malnourished children.[ns]
- c. 11.1% of mothers of PD children quarreled 3 or more times a week with their husband/partner, vs. 6.7% of mothers of malnourished children. [ns]
- d. Mothers were given six specific situations and asked during which of the situations was it okay for a husband to hit or beat his wife (as a proxy for spousal abuse). Mothers of PD children mentioned 3.27 situations on average when it was okay for a man to hit or beat his wife. Mothers of malnourished children mentioned 3.16 situations on average when it was okay for a man to hit or beat his wife. [ns] The percentages for both groups were as follows:
  - If she goes out to do something without telling him: 55.6%
  - If she neglects the children: 77.8%
  - If she argues with him: 55.6%
  - If she refuses to sleep with him or have sex with him: 38.4%
  - If she burns the food: 55.6%
  - Any other reason: 21.2%
- e. 6% of mothers of PD children said that someone in their family needs to cut their alcohol consumption vs. 16.3% of mothers of malnourished children. [ns]

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

- a. We used a six item instrument to calculate to what degree mothers had signs of depression. (Higher score = more depressed.) Mothers of PD children had an average score of 12.24 vs. an average score of 12.67 for mothers of malnourished children. [ns]
- b. According to their remarks on these questions, all mothers
  - Felt sad three or more days per week: 28%
  - Felt lonely three or more days per week: 37%
  - Had crying spells three or more days per week: 21%
  - Did enjoy life three or more days per week: 57%
  - Felt depressed three or more days per week: 27%
  - Felt little interest or pleasure in doing things three or more days per week: 43%
- c. 74% mothers of PD children said that they felt depressed on half or more days of the week vs. 72.9% of mothers of malnourished children. [ns]

### **13. Hygiene Practices**

- a. Mothers were asked which hygiene practices they regularly teach to their child. Mothers of PD children mentioned 3.22 practices on average vs. 2.48 practices mentioned by mothers of malnourished children. (Total possible = 14.) [ns]
- b. 47% of all mothers of PD children claimed to have used soap or ashes in the past day or previous day for cleaning or washing vs. 44% of mothers of malnourished children. [ns]
- c. When asked about storage and coverage of water containers in the home, 88.2% of mothers of PD children mentioned storing and covering water in the household vs. 89.8% of mothers of malnourished children. [ns]
- d. 13.7% of mothers of PD children and 18% of mothers of malnourished children reported using any water treatment method.[ns]
- e. 13.7% of mothers of PD children reported using water purification and vs. 16% of mothers of malnourished children. [ns]
- f. Mothers were asked of any practices that they use to keep food safe to eat. Mothers of PD children claimed to be doing an average of 5.2 proper food handling practices vs. an average of 4.7 practices for mothers of malnourished children. [ns]
- g. 98% of mothers of PD children and 94% of mothers of malnourished children reported doing any safe food handling practices.[ns]

### **14. Particular Nutrients**

- a. **High-fat foods:** PD children consumed high-fat foods on average 4.2 times per week vs. 3.5 times per week for malnourished children. [ns]
- b. **Zinc-rich foods:** PD children consumed zinc-rich foods on average 4.7 times per week vs. 3.9 times per week for malnourished children. [ns]
- c. **B12-rich foods:** PD children consumed B12-rich foods on average 0.4 times per week vs. 0.2 times per week for malnourished children. [ns]

## **Annex G**

### **Modifications to the Questionnaire in Bolivia**

Modifications were made to the questionnaire in each field where it was used in order to make it more culturally appropriate and to improve it as more experience was gained. The list below is one example of the modifications that were made as it was being used in Bolivia. The changes in the questionnaire suggested by the Bolivia field included the following:

1. Added a general instruction page to front. It instructed interviewers to fill out questionnaire in pencil, reviewers to use red pen, a place to write signature of interviewer, reviewer, and person who enters data. Added question asking for informed consent. Added spaces for Supervisor and Interviewer name. Added box to check off that person gave informed consent.
2. Question 2 (Q2) – Added “principally” to refer to what is the main component of the roof if several are mentioned.”
3. (Q17)– To better guide the interviewer, a table was added to fill out, i.e. 3 columns – time, food, ingredients.
4. (Q18) – Added “Now we are going to talk about...” above Question #18 so it’s clear that “meals” and “snacks” are not overlapping.
5. (Q21) – There was a translation issue with this question, because moms often share their plate with the child they are feeding. “Plato comun” was added used to refer to common plate.
6. (Q23) – Added “threaten” to the list of answers. Divided out better so there was less apparent overlap.
7. (Q25) – Added more instructions, i.e. must write a number, don’t leave any spaces blank, must use a number, not Yes/No.
8. (Q30) – Added instructions to show participant an example of an iron supplement.
9. (Q32) – We added the phrase “in comparison to other babies/children in the community”.
10. (Q41) – Response categories were numbered in order to be consistent with the data input program.
11. (Q56) – although this is no legally recognized polygamy in Bolivia, there are men that may be legally or “common law” married to one woman and have another “mistress” family on the side. For that reason, we added the question “Tu esposo mantiene hijos con otro mujer?” to identify these situations.
12. (Q66) – We added “no viva con pareja” (don’t live with a partner) to answer 5.
13. (Q67) – Made sure translation included “disputing” and “fighting” to clarify the difference between fighting with words and physical fighting.
14. (Q68) – Clarified the instructions, i.e. first ask the question and then mark with an X in the corresponding column the respondent’s answer. Created the option for “jealousy” .
15. (Q74) – Added instructions to only mark one answer.
16. (Q76) – We added an introductory question to put the situation in context. “Cuantos recipientes tiene para guardar agua?” (How many containers do you store water in?)