

even poor appetite as something requiring immediate action. Mothers of older children, however, may feel that something is really wrong when the child refuses to eat, and therefore, they need to take action to encourage children to eat, or to compensate for the child's poor appetite.

Table 8.6. Changes in care practices during feeding, by child age

Practice	Age (months)			
	6-11	12-23	24-35	36-48
Caretaker takes action if child refuses to eat	56.8	70.5	77.5	74.9
Caretaker takes action if child has poor appetite	59.8	84.0	96.6	96.1
Child eats alone	3.4	57.3	92.4	96.0

Feeding during diarrhea

Continued breastfeeding, feeding of complementary foods and fluid replacement are particularly important during diarrhea in order to prevent dehydration and malnutrition. Findings from our formative research suggested that the importance of fluid replacement during diarrhea was well understood by mothers (Menon et al. 2003). These results are partially confirmed in the quantitative survey, but we still find close to 20 percent of mothers who report giving less liquids to their child during diarrhea and close to 8 percent who report giving no liquids at all (Table 8.7).

An even larger percentage of mothers gave less semi-solid or solid foods to their child during diarrhea (60 percent) and 4 percent stopped giving solid foods all together. This may be due to the fact that children with diarrhea often experience anorexia or vomiting, and thus mothers just cannot feed their children the same amounts as usual. Unfortunately, this type of information is not available in our survey. Increased feeding *after* diarrhea and other infectious diseases is also key to adequate recovery and prevention of nutritional deficiencies and poor growth. This information, also, was not collected in our survey.

Table 8.7. Changes in feeding of liquids and food during diarrhea

	Recuperative [n=396] ¹ %	Preventive [n=447] ¹ %	Total [n=843] ¹ %
Liquids (q411)			
- much less	4.3	4.3	4.3
- little less	17.2	13.0	14.9
- about the same	23.0	22.1	22.5
- more	48.5	51.5	50.1
- gives nothing to drink	6.8	8.3	7.6
- does not know	03	0.9	0.6
Semi-solid and solid foods (q412)			
- much less	15.7	18.1	17.0
- a little less	45.2	40.9	42.9
- about the same	25.3	25.5	25.4
- more	4.8	6.9	5.9
- stopped giving food	4.3	4.0	4.2
- does not know	4.8	4.5	4.6

¹Note: these questions were asked only for children who had had diarrhea previously, which explains the smaller sample sizes.

8.4 Conclusions

In summary, the survey data on child feeding practices concurred well with the previous findings from our formative research on child feeding practices. The positive practices observed are that breastfeeding is almost universal and that the vast majority of mothers breastfeed their child up to at least 18 months of age. A variety of less optimal feeding practices are observed, however, including low rates of exclusive breastfeeding, widespread use of baby bottles and very early introduction of complementary liquids, semi-solids and solid foods. The diet of young children in these communities also appears to be inadequate in terms of dietary diversity and the frequency of feeding nutrient-rich foods like animal source foods. Most children in our sample were not assisted to eat by a caregiver, suggesting that children are expected to learn to feed themselves early on, especially so after they reach 12 months of age. Finally, the data indicate that although most caregivers report taking some action when children refuse to eat or have a poor appetite, this is much more common for older children than for infants. Programs to improve infant and young child feeding practices in rural Haiti, thus, have a variety of challenges to address in order to improve infant and young child feeding practices on the whole, and feeding practices for infants under the age of 12 months in particular.

9 CHILD CARE PRACTICES II: HEALTH CARE SEEKING, HYGIENE & DISCIPLINE

9.1 Introduction

This chapter examines the child care practices related to the use of preventive and curative health care, as well as hygiene practices and discipline strategies used by the survey respondents.

The types of information collected, the variables available and the composite scales created are described below, followed by a presentation and discussion of the results.

9.2 Variables and composite scales

Information was collected by maternal recall on the following aspects: 1) preventive health care seeking behaviors (use of immunization and prenatal care); 2) curative health care seeking behaviors for episodes of diarrhea, fever and ARI; 3) hygiene behaviors related to bathing children; and 4) the use of physical punishment to discipline children. Spot check observations were also used to observe markers of child, respondent and household hygiene practices, for example the cleanliness of the mother and child's hands, hair, clothes and face, and the cleanliness of the interior and exterior of the house. Data on these markers were collected for both the index child (18-47 months of age) and his/her younger sibling (0-17 months of age).

According to WHO's recommended schedule for immunization (WHO 2002), a 12-month old child should be fully immunized, that is he/she should have received BCG at birth, 4 doses of polio, 3 doses of DTP and a measles vaccination. Field workers recorded the information on immunization from the child's health card, and completed it with maternal recall when the card was either unavailable or incomplete. Three indicators were derived for all index children in our survey sample to determine whether or not they were fully immunized (since all index children were older than 12 months, they should all have been fully immunized based on the WHO schedule of immunizations). The three indicators are the following:

Fully immunized by card: this indicator was given a score of 1 if, according to the child health card, he/she had received all immunizations; and 0 if he/she was missing one or more vaccines.

Fully immunized by recall: the same coding as above was used, but with the information obtained by maternal recall.

Fully immunized by recall or card: the same coding as above was used, but with the information obtained either by maternal recall, health card, or both.

Composite scales were created to assess the overall cleanliness of the child, mother, as well as the interior and exterior of the house. The coding table for the cleanliness scales is presented in Appendix 9.1. All scales were created in such a way that higher scores meant better hygiene or “cleanliness”. The scales created are described below.

Child cleanliness scale: Five aspects of child cleanliness were observed by spot check observations, which were done both for the index child and his/her younger sibling. Four of the observations assessed the cleanliness of the child’s hands, hair, clothes and face, while the fifth assessed whether the child had a runny nose that had not been cleaned. The cleanliness of the child’s hands, hair, clothes and face were assessed on a 3-point scale that measured whether each part of the body observed was dirty (scored as 1), dusty (scored as 2) or clean (scored as 3). For children who were naked at the time of the observation, the cleanliness of their body was observed in place of the cleanliness of their clothes. The variable that evaluated whether the child had an *unattended* runny nose was coded as a yes/no variable, where a score of “0” was assigned to “yes” and a score of “1” was assigned to “no”. The overall child cleanliness scale was created by summing the scores on all five observations, including the cleanliness of the nose, and ranged from a possible minimum of 4 to a possible maximum of 13. The child cleanliness scale had a high reliability (Cronbach’s alpha=0.91 for the scale created for naked children, and 0.92 for the scale created for the clothed children).

Respondent mother cleanliness scale: The respondents’ cleanliness was assessed by observing the cleanliness of their hands, hair, clothes and face. As with child cleanliness, the assessment of cleanliness was made on a 3-point scale that measured whether each aspect observed was dirty (coded as 1), dusty (coded as 2) or clean (coded as 3). The overall respondent cleanliness scale was created by summing the scores on the four variables, and ranged from a possible minimum of 4 to a possible maximum of 12. The respondent cleanliness scale had a reliability of 0.83 as assessed by Cronbach’s alpha.

House interior cleanliness scale: The cleanliness of the interior of the house was assessed using observations of 3 individual features of cleanliness as well as an overall assessment of interior cleanliness. The individual features that were observed were evaluated on a simple yes/no basis, and the observations assessed whether the interior of the house needed to be swept, whether the drinking water container was covered and whether one could observe piles of dirty clothes inside the house. These latter 3 variables were combined as a summative scale of house interior cleanliness after ensuring that all the variables were coded in such a way that a 0 code indicated poorer hygiene and a code of 1 indicated better hygiene. The house interior cleanliness scale thus created ranged from a minimum of 0 to a maximum of 3, and had a Cronbach’s alpha of 0.86. The sample size for the observations of the house interior was somewhat smaller than for the other observations because not all observers were able to conduct observations inside the houses.

House exterior cleanliness scale: The cleanliness of the environment around the house was assessed using observations of 4 individual features of cleanliness as well as an overall assessment of environmental cleanliness. As with the variables that assessed the cleanliness of the interior of the house, those used to observe the cleanliness of the exterior were also evaluated on a simple yes/no basis. The observer recorded whether the space outside the house needed to be swept, whether any human or animal feces could be observed and whether there was any garbage around the house. These four individual observations were combined to create a summative scale of house exterior cleanliness. The house exterior cleanliness scale ranged from a minimum of 0 to a maximum of 4, and had a Cronbach’s alpha of 0.62.

9.3 Results

9.3.1 Preventive care seeking behaviors

Immunization

The percentage of fully immunized index children (18-47 months) was assessed by asking mothers to show their child’s health card, and verifying the vaccines recorded. For mothers who did not have a health card available, field workers asked them to recall whether or not the child had received the different vaccines. Only 62 percent of mothers had a health card. Of those, 23 percent had a child fully immunized. Among the remaining mothers, only 9 percent reported that their child had received all immunizations required and thus could be considered fully immunized based on maternal recall. Overall, 17.8 percent of all index children were fully immunized, based on either their health card or maternal recall (data shown in Table 9.1). This is a very low percentage, and is substantially lower than the rate documented for all rural areas of Haiti in the latest DHS survey (EMMUS-III 2001). It is possible that the area included in our study is particularly poorly served by health services and that the newly implemented program by World Vision will significantly improve immunization coverage. There were no differences between program groups or child gender in the percentages of fully immunized children, or in the percentage who had a health card and those who did not.

Table 9.1. Immunization status by program group.

Immunization status	Program group		Total
	Recuperative	Preventive	
Fully immunized (according to card) (N with card=933)	21.7	24.4	23.0
Fully immunized (from recall; (N=581)	11.6	6.9	9.3
Fully immunized (card or recall); (N=1514)	17.8	17.7	17.8

Use of prenatal and postpartum care

The proportion of women using different types of prenatal care is shown in Table 9.2. The findings related to the use of prenatal care are encouraging in that about 80 percent of respondents reported having consulted a health professional when they were pregnant with their last child. However, there were still about 14 percent of respondents who had not consulted any one for prenatal care. The proportion of women who consulted a health professional during their pregnancy is very similar to that reported in the Haiti DHS data gathered in 2000 (79 percent). There were small differences in the use of prenatal care by program group; respondents in the recuperative group were slightly more likely to have consulted a health professional than those in the preventive group. Similarly, a slightly larger proportion of women in the recuperative group reported taking iron pills during their pregnancy. In both groups, a large proportion of women were likely to have had their first consultation with a health professional around 3-4 months into their pregnancy, about 60 percent of women had between 1 and 3 prenatal consultation visits, and about 20 percent had 4 visits or more.

The proportion of respondents who reported having experienced signs of night blindness during pregnancy was 13.7 percent, with no difference between the program groups. Although the percentage of women who reported night blindness during pregnancy is not as high as in some countries of Asia, it still raises serious concerns. Mortality among mothers who suffered from night blindness during pregnancy in Nepal was four times higher than among non-night blind women (Christian et al. 2000). The risk of mortality for their young infant was also greater among the group of night blind, compared to the non-night blind mothers (Christian et al. 2001). Prevention of vitamin A deficiency during pregnancy in poor countries such as Haiti must therefore be taken very seriously.

The majority of women reported being attended by a midwife for their child's delivery (Table 9.3), and a very small proportion were attended by health professionals or others such as family members. About 5 percent of respondents in the recuperative group reported having received no assistance at all during delivery. This proportion was 3 percent in the preventive group. The survey results are, in general, comparable with the results of the Haiti DHS (EMMUS-III, 2001) regarding the assistance received during delivery, except that a larger proportion of the baseline survey respondents were assisted by midwives than the proportion reported in the DHS.

Table 9.2. Use of prenatal care by program group

Characteristic	Variable name	Recuperative [n=759] %	Preventive [n=755] %	Total [n=1514] %
Prenatal consultations during pregnancy	<i>Q3011</i>			
- Did not consult anyone		13.3	14.1	13.7
- Health professional		82.7	79.1	80.9
- Other		4.0	6.9	5.4
Number of prenatal visits to a health professional	<i>Q304</i>			
- Never visited		17.3	20.9	19.1
- 1 to 3 visits		62.2	56.9	59.5
- 4+ visits		19.9	21.5	20.9
Stage of pregnancy at first visit to a health professional	<i>Q303</i>			
- Never visited		17.3	20.9	19.1
- < 6 months pregnant		65.5	66.9	66.1
- 6-7 months pregnant		14.9	10.5	12.7
- 8+ months pregnant		1.6	1.5	1.5
Took iron pills when pregnant	<i>Q305</i>	66.3	63.2	65.1
Experienced night blindness when pregnant	<i>Q307</i>	13.4	13.9	13.7
Months of pregnancy at first use of prenatal consultation	<i>Q303</i>	Median 4.0	Median 3.0	Median 3.0

Table 9.3. Assistance during delivery and postnatal care by program group.

Characteristic	Variable name	Recuperative [n=759] %	Preventive [n=755] %	Total [n=1514] %
<i>Assistance during delivery</i>	<i>Q3091</i>			
- No one		4.9	2.9	3.9
- Health professional		5.3	7.4	6.3
- Midwife		83.5	83.3	83.4
- Other		6.0	5.7	5.9
<i>Place of delivery</i>	<i>Q310</i>			
- Health institution		4.3	6.9	5.6
- Own home		87.5	85.2	86.3
- Other home		7.5	7.0	7.2
- Other		0.7	1.0	0.7
Received Vitamin A supplement at birth or soon after	<i>Q312</i>	8.0	7.7	7.9
<i>Size of child at birth</i>	<i>Q308</i>			
- Very big		20.8	21.7	21.3
- Big		6.9	5.3	6.1
- Average		30.6	30.1	30.3
- Smaller than average		16.5	17.4	16.9
- Very small		25.3	25.4	25.4

Over 85 percent of survey respondents reported giving birth at home, the majority in their own home and a small proportion in someone else's home. This proportion was not different between the two program groups. Overall, only about 6 percent of respondents reported giving birth in a health institution. When asked about the size of their infant's at birth compared to other infants about 25 percent of respondents indicated that their infant was very small, and about 17 percent said their infants were smaller than average. Although these data cannot be used as an indicator of low birth weight, the large proportion of women who reported smaller than average and very small infants (combined total of over 40 percent) is of concern.

Finally, only 8 percent of women reported receiving a vitamin A supplement immediately after they had given birth. This low figure is of real concern given the important role of supplementing women immediately after delivery to ensure that their infant receives adequate amounts of vitamin A through breast milk, and the reported

prevalence of night blindness among pregnant women. Reaching women soon after delivery to administer a vitamin A supplement and ensure postnatal care is a component of World Vision's program services in the Central Plateau area. Our data suggest that this aspect of their programming, which is done through a system of home visits, will need to be strengthened to ensure that women do in fact receive the supplement within the first two weeks following delivery.

9.3.2 *Curative health care seeking practices*

This section reports the health care seeking practices of respondents whose children had experienced fever, cough/cold, fast breathing or diarrhea in the two weeks preceding the survey. Table 9.4 presents the types of health care seeking practices used by caregivers in our sample for each type of illness.

A high percentage of caregivers reported having sought advice when their child was sick. More than 80 percent of the caregivers reported seeking advice for fever, cough/cold or more severe respiratory symptoms, and 72 percent for diarrhea. Interestingly, the most common sources of advice were the medical sector and family members. For fever or severe respiratory symptoms, caregivers were more likely to seek advice from the medical sector, whereas for the common cold or for diarrhea, family members were the most common source of advice. A very low percentage of caregivers reported consulting program health agents or *colvols*, although they were more likely to do so for diarrhea than for the other symptoms. This is probably due to the fact that health agents give lectures about diarrhea in the rally posts and thus, may appear knowledgeable and a good source of information on that topic. The relatively low reliance on health agents or *colvols* overall, may also be due to the fact that many of them do not live in (or close to) the communities where they work.

There was little evidence of differences between treatment groups or between genders in the percentage of caregivers who reported seeking advice for the different symptoms (see Figures 9.1 and 9.2). The source of advice for the different types of symptoms was also very similar between the groups (not shown), with the medical services and family being favored for all symptoms.

Table 9.4. Use of curative health services (children 18-47 months of age; n=1514)

	Fever	Cough/cold	Fast breathing/ shortness of breath	Diarrhea
% who had in previous 2 weeks	47.9	65.4	15.5	32.1
% who sought advice (among those who reported symptom)	82.2	81.0	80.9	72.0
% who sought different treatments (among those who reported symptom)				
- Medical sector	43.0	27.8	53.9	25.4
- Family	33.2	55.1	37.7	29.7
- Health agent/colvols	2.3	0.9	1.6	4.9
- Traditional doctors	5.7	10.5	2.6	3.5
- Pharmacy	6.8	1.9	3.1	4.1
- Itinerary vendor	7.7	2.4	0.5	3.1

Feeding during diarrhea

There seems to be a relatively good understanding of the need to increase the amounts of liquids offered to children during diarrhea, as seen by the fact that half of the mothers reported doing so (Figure 9.3). There is, however, still a large proportion of mothers who report decreasing the amount of liquid offered to the child during diarrhea. The majority of mothers report reducing the amount of food offered to the child, a phenomenon widely documented in other settings and often associated with the child's refusal to eat, severe anorexia and/or vomiting during diarrhea episodes.

Health care seeking for diarrhea

Although 97 percent of the mothers interviewed reported having heard of oral rehydration salts, only 40 percent reported using it (Figure 9.4), and as little as 10 percent had used a home-made preparation. Traditional medicines were a more popular treatment for diarrhea, which more than half of the mothers reported using. It would be important to investigate what the most common traditional medicines are, whether they are made with water and what their electrolyte content is. A slightly higher percentage of caregivers from the preventive group reported using oral rehydration salts and syrups for treatment of diarrhea than caregivers from the recuperative group (Figure 9.4). Traditional medicines, on the other hand, were more popular among caregivers from the recuperative group. Treatments used for diarrhea did not differ by gender of the child (Figure 9.5).

9.3.3 Hygiene practices

As described in section 9.2, data on hygiene practices were gathered primarily by spot observations and information was gathered on markers of hygiene behaviors rather than on the behaviors themselves. The only hygiene practice for which recall was used was child bathing, where respondents were asked how often they usually bathed their child, and what they used to bathe the child (e.g., water, soap and water).

The recall data on bathing practices indicate that over 95 percent of respondents in both program groups reported bathing their children either twice or even thrice a day. Furthermore, more than 96 percent of respondents reported using soap and water to bathe their child with, rather than just water. There were no differences in these reported practices either by child age or child gender. Given the water scarcity and time constraints faced by women in our sample, and their reported frequent absences from home, the overwhelmingly positive responses to these questions could indicate a social desirability bias rather than actual practice.

Mean values for the summary hygiene scales are presented in Table 9.5. There were no differences between the program groups in any of the mean scores to the hygiene scales. For all scales, the mean values were towards the upper end of the possible range of values, indicating that in general, the cleanliness of most children, respondents and houses were rated highly by the observers.

Table 9.5. Mean hygiene scale scores for index children and houses, by program group.

Characteristic	Variable name/ range	Recuperative [n=759]			Preventive [n=755]			Total [n=1514]		
		N	Mean	SD	N	Mean	SD	N	Mean	SD
Child cleanliness scale (naked children)	<i>nchclean</i> (4-13)	482	9.3	2.8	463	9.2	2.8	945	9.2	2.8
Child cleanliness scale (clothed children)	<i>cchclean</i> (4-13)	276	9.9	2.7	293	10.0	2.7	569	9.9	2.7
Overall child cleanliness score	<i>chclean</i> (4-13)	758	9.5	2.8	753	9.5	2.7	1511	9.5	2.8
Maternal cleanliness scale	<i>motclean</i> (4-12)	759	9.9	2.2	755	9.8	2.3	1514	9.8	2.2
House interior cleanliness scale	<i>intclean</i> (0-3)	647	2.3	1.0	649	2.3	1.0	1296*	2.3	1.0
House exterior cleanliness scale	<i>extclean</i> (0-4)	759	3.40	1.0	755	3.4	0.9	1514	3.4	0.9

*The sample size is lower for the observation of the interior of the houses because not all observers had access to the interior of the house.

The scores on the child cleanliness scales differ somewhat with child gender, and are higher for girls than for boys (mean of 9.9 for girls and 9.2 for boys). The scores also change considerably with child age (Figure 9.6), and the highest scores are seen for youngest children (0-5 months). The difference in scores between this age group and the following one (6-11 months) is almost 2 points on the overall scale, and the difference between the 6-11 month group and the 12-18 month group is about half that magnitude (about one point on the scale). Subsequent age differences are generally small.

The sharp decrease in mean scores on the hygiene scales with child age in the first year of life is not unexpected and it is related to the child's developmental and motor abilities at the time of the observation. An examination of the mean hygiene scores by the child's activity at the time of the observation shows that the scores are strongly influenced by what children were doing when they were observed. As shown in Figure 9.7, the child cleanliness scores are highest for children who were being carried or who were sitting on a chair/bed, compared to children who were sitting on the bare ground, crawling or walking. There is also a strong relationship between age and child activity, again not unexpected given the different motor skills of children in these different age groups. For example, whereas 87.5 percent of children between 0 and 5 months of age were being carried when the observation was conducted, only 70 percent of children 6-11 months were, and 15 percent of children in this age group were crawling. In the 12-18 month age group, even fewer (44.5 percent) were being held, and more children were either crawling or walking.

These findings are useful in helping to interpret the results of the spot observations of children's cleanliness. They suggest that cleanliness of the child should be interpreted within narrow age ranges, just as feeding practices are, because the child's cleanliness is largely dependent on his/her developmental stage. The fact that an 18 month old child is less clean than a 4 month old one does not necessarily reflect a negligent or unhygienic caregiver, but rather it is related to the greater mobility of older children and their need to explore their environment. Clearly, some active toddlers get more dirty than others through their exploration and these differences are, at least in part, related to the cleanliness of their environment, as well as to the level of attention (and care) that they receive from their caregiver and other family members. So, the child cleanliness scale can be useful to compare children within age ranges, but our findings suggest that it should not be used to compare children across age ranges.

9.3.4 The use of physical punishment

Table 9.6 shows the use of physical punishment strategies by respondents in the two program groups. Respondents were asked about their frequency of use of two types of physical punishment: "taps", which are small taps usually given to children as a preliminary strategy to make them listen to their parents, and the use of hitting, which is considered a more extreme form of physical punishment than the use of "taps". The use of both forms of physical punishment was high, in general, with over 95 percent of respondents reporting the use of taps, and about 80 percent reporting the use of hitting to make children listen.

Table 9.6. Child discipline strategies, by program group.

Discipline practice	Variable name	Recuperative [n=759] %	Preventive [n=755] %	Total [n=1514] %
Have given children a few taps to make them listen	<i>Q809a</i>			
- often		39.4	33.2	36.3
- sometimes		58.4	63.0	60.7
- never		2.2	3.7	3.0
Have <u>hit</u> children to make them listen	<i>Q809c</i>			
- often		17.3	13.2	15.3
- sometimes		66.3	67.9	67.1
- never		16.5	18.8	17.6

There were no large differences between the two program groups in the frequency of use of these strategies, but more respondents in the recuperative group appeared to have used both taps and hitting often than those in the preventive group. There were also no large differences by child gender, though respondents who had a boy index child reported a slightly larger propensity to use both taps and hitting to make their children listen. Since this question was not asked in relation to a specific child, but rather in relation to the use of the practice by the *respondent* to make any of her children listen to her, it is not really possible to interpret the data in terms of the use of physical punishment for children of either gender. For the same reason, there are no apparent differences in the frequency of use of these strategies by child age. If the question had been asked about one child in particular, the pattern by child age would likely have been different, possibly with a greater use of physical punishment for older children than for infants and toddlers.

9.4 Conclusions

Our findings indicate that access to preventive health services for children, particularly the coverage of immunization services, is alarmingly low, even compared to Haiti standards. Access to prenatal care for women, on the other hand, appears to be much better: the vast majority of women reported having attended prenatal consultations with a health professional (81 percent) during their last pregnancy; up to two thirds of those who attended prenatal visits did so for the first time during their first 6 months of pregnancy; and more than half of them attended prenatal consultations between 1 to 3 times during their last pregnancy. Close to two-thirds of women also reported having received iron supplements during pregnancy. The majority of births took place at home with the help of a midwife. Few mothers were assisted by a health professional (6 percent), and a troubling 4 percent received no assistance during delivery. Very few women received vitamin A supplements after delivery, probably a reflection of the unavailability of the supplements, combined with the lack of awareness and training of midwives in their use. These aspects of programming in the Central Plateau area need to

be strengthened substantially, especially given that 14 percent of women reported having suffered from night blindness during their last pregnancy.

Regarding the use of health services for curative care, the majority of mothers reported seeking advice when their child experienced symptoms of fever, cough/cold, ARI or diarrhea. The type of advice sought, however, differed depending on the symptoms, with respondents being more likely to seek help among medical professionals when the child had ARI symptoms or fever, suggesting that they recognized the severity and greater risks associated with these symptoms. World Vision program health agents and *colvols* were rarely mentioned as a source of advice for any of the symptoms listed. This is probably a reflection of the fact that the program was new in the area and therefore the staff may not have established credibility yet, combined with the fact that most health agents did not reside in the communities.

Overall, child, maternal and house hygiene were quite good, considering the limited means available to these poor families to maintain good hygiene. As expected, more mobile children in their second and third year of life were more likely to be rated as “dirty” by our field workers than infants in their first year who tend to be held and protected from environmental contamination. Finally, our survey found a high prevalence of the use of physical punishment to make children listen to their parents (two thirds reported using it sometimes), a practice that is highly discouraged for its negative influence on child developmental outcomes. As highlighted in Chapter 7, these findings are somewhat in contradiction with the reported perceptions of the respondents about discipline, where only one third of them believed that hitting was an appropriate disciplinary approach. Programs focused on parenting practices will clearly have to pay attention to this high prevalence of using physical punishment and attempt to sensitize parents to the detrimental impact on children.

10. ASSOCIATIONS BETWEEN HOUSEHOLD AND CAREGIVER RESOURCES, CARE PRACTICES AND CHILD OUTCOMES

10.1 Introduction

In the conceptual model presented in Chapter 2, child survival, growth, and development are postulated to depend on adequate nutrient intake (adequate food), health, and care practices. Each of these, in turn, depends on community, household, and caregiver resources. One fundamental contribution of this conceptual model is the recognition that none of these, alone, is sufficient to ensure good outcomes. Adequate food, in the absence of care and a healthy environment, will not be enough to protect and nurture children. Similarly, exceptional care, in the absence of adequate food, will not be enough. In different contexts, lack of adequate food, illness and lack of health care, or less than optimal care practices (child feeding, hygiene, care-seeking, etc.) may be the most important constraint on child growth and development. Further, adequate caregiver resources are not enough to ensure optimal care in the absence of the household and community resources that are needed for that care to occur.

The results presented in this chapter, thus, explore how the various elements in the conceptual model – as measured in the baseline survey – interact in the context of the communities covered by the program evaluation. This is done through an assessment of bivariate relationships between a variety of household and caregiver resources, care practices and child outcomes. The objective of exploring these bivariate associations was to understand which of the theoretical relationships laid out in the conceptual framework are actually reflected in associations between variables assessed in the baseline survey. It is anticipated that this first stage of analysis then will form the basis for future multivariate analyses with these data.

10.2 Variables and Analysis

The variables and scales used in the analyses presented in this chapter have already been described in previous chapters.

In this chapter, analyses were conducted only for the index children (between 18 and 47 months). Including the younger children would mean including more than one child per household and would have created the problem of non-independent observations. Bivariate associations were explored using cross-tabulations and comparisons of means. The tests used to assess the statistical significance of the associations included Chi-square and Fisher's exact tests for categorical variables and analysis of variance for continuous variables. Where appropriate, linear trends were also assessed.

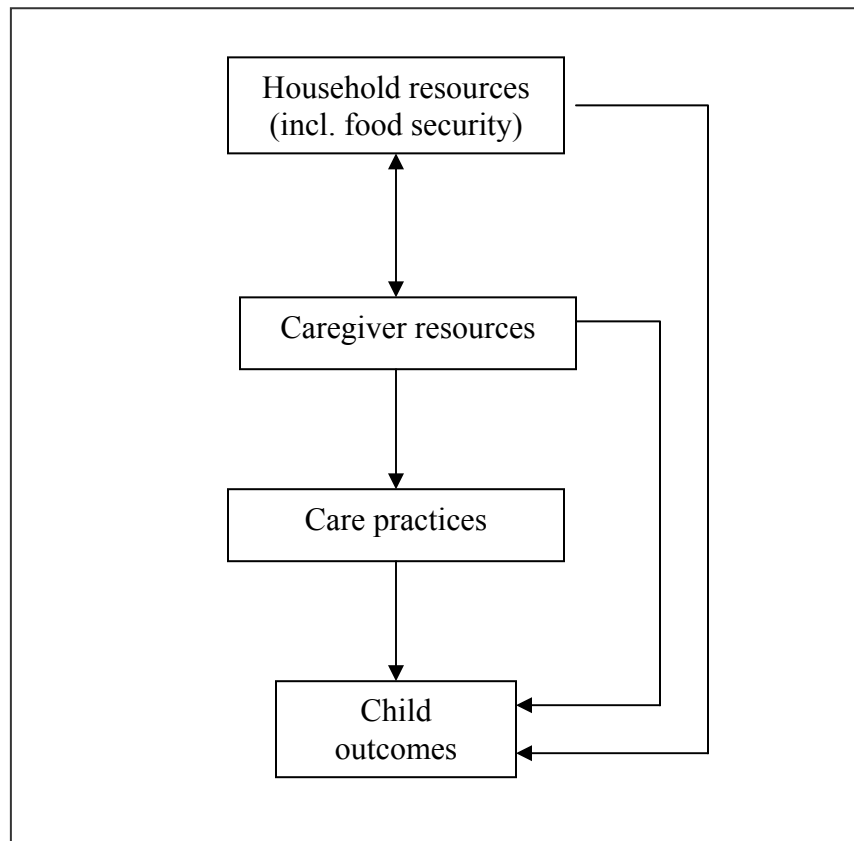
The approach taken to interpret the results of the bivariate analyses was to examine statistical significance as well as the consistency of the results and magnitude of effects. For example, when a proxy variable for wealth (for example, the asset index) was consistently and strongly associated with other variables, in the expected direction, we

were more confident that the proxy is representing the domain of interest, and would be of use in further analyses. The magnitude of differences between groups is also important; for example, some comparisons for age subsets may not reach significance because of a limited sample size in the subset but the differences between age groups might in fact be of a large enough magnitude to warrant further investigation. When differences are large and consistent, variables may be well measured and useful even when comparisons are not statistically significant. Conversely, some statistically significant differences may be too small to be of practical importance.

If associations are not observed, either the association does not exist in this study sample, or one or both variables were not well-measured. If variables are not well-measured, associations cannot be detected. In either case – where there is no true association or where constructs are not well measured – the variables will be less useful in further analyses.

The associations explored through the bivariate analyses are outlined briefly in Figure 10.1. In addition to exploring relationships between the elements shown in Figure 10.1, relationships between child appetite (as reported by the mother), feeding practices, and outcomes, are also explored. While child appetite is not explicit in the conceptual framework in Figure 2.1 in Chapter 2, research on care and nutrition has recognized the important role of appetite and other characteristics of the child, both in determining intake and in shaping caregivers' responses (Ruel and Arimond, in press).

Figure 10.1: Bivariate associations explored



Detailed information on variables that were used to represent different elements in the conceptual model is presented in Table 10.1. For some elements (for example, household socio-economic status) the number of variables is small, reflecting the fact that there is much experience with operationalizing these concepts, and with reducing a large number of original variables to a small, manageable number of proxy indices (such as the asset and housing indices). For other elements (for example, some caregiver resources) experience with measurement is limited, especially in the context of nutrition studies, so a more exploratory approach was taken and many comparisons were assessed. Finally, a number of child feeding variables constructed from the 24-hour and 7-day food group recall are used here considered both as proxies for food intake and nutrient adequacy, and as reflecting current child feeding practices.

10.3 Results

The presentation of results reflects the relationships outlined in Figure 10.1, and the overall conceptual framework. Those elements further away from child outcomes in the conceptual framework (household and caregiver resources) are presented first, then care practices and finally outcomes. Relationships between household and caregiver resources are presented first, followed by associations between these resources and care practices. Then, the associations between the resources and child outcomes are presented and finally, associations between care practices and child outcomes.

For each set of bivariate relationships explored, Boxes 10.1 through 10.17 and Tables 10.2 through 10.14 show relationships that were both statistically significant *and* conceptually meaningful. The statistical criterion used was a p-value of $< .05$ (Chi-square, Fisher's exact, or ANOVA) and/or evidence of a linear trend (also $p < .05$). However, in certain cases associations were statistically significant but not meaningful; these associations are not listed in the boxes. For example, there was a significant difference between the mean health self-perception of women in low, middle, and high dependency ratio households. However, the relationship was not ordered, with the lowest health self-perception scores observed in the middle group for the dependency ratio. There is no conceptual basis for expecting health self-perception and dependency ratios to have a U-shaped relationship, and the observed significance may be due to chance.

Because numerous comparisons were made many results are presented in a summarized form in the boxes, which are explained below. Where particularly strong or interesting relationships were observed, tables are used to present selected descriptive statistics.

Table 10.1. List of variables and composite scales included in bivariate analyses

Element in conceptual model	Variables and composite scales
Household resources	Partner's education Asset index (value of durable goods, productive assets, and livestock) Housing quality index (floor, wall and roof materials) Dependency ratio Household access to food (food insecurity scale)
Caregiver resources	Maternal BMI Health self-perception scale Maternal education Feeding knowledge scale Maternal occupation Main occupation Employed in last year Location of work How often away from home How long away when she goes Maternal empowerment/social support scales Contact with own family Has someone to talk to Couple communication scale Ownership of assets scale Control over purchases scale Involvement in decision-making scale Frequency of anxiety/depression-related symptoms scale Time stress scale Life satisfaction scale Help with household tasks scale Financial/material support scale Community participation scale
Care practices	Early feeding practices (by recall) Initiation of breastfeeding Only breastmilk on day one Gave colostrum Current feeding practices Ages 18-23 months Use of baby bottles Still breastfed Adequacy of frequency of feeding Child is helped to eat Ages 24-35 months Child is helped to eat Ages 18-47 months Number of meals yesterday Dietary diversity yesterday Number of animal source foods yesterday Number of vitamin A-rich plant foods yesterday Any flesh foods 3 or more days in last 7 Eggs 3 or more days in last 7 Orange/red vitamin A-rich plant foods 3

Element in conceptual model	Variables and composite scales
	<p style="text-align: center;">or more days in last 7</p> <p style="text-align: center;">Feeding during diarrhea</p> <p style="text-align: center;">More liquids</p> <p style="text-align: center;">Same or more food</p> <p style="text-align: center;">What is done when child refuses food</p> <p>Proxies for hygiene practices</p> <p style="text-align: center;">Child cleanliness scale</p> <p style="text-align: center;">Maternal cleanliness scale</p> <p style="text-align: center;">Exterior (compound) cleanliness scale</p> <p style="text-align: center;">Interior (house) cleanliness scale</p> <p>Discipline practices</p> <p style="text-align: center;">Giving child “taps”</p> <p style="text-align: center;">Hitting child</p>
Child outcomes	<p>Height-for-age z-scores</p> <p>Weight-for-age z-scores</p> <p>Weight-for-height z-scores</p> <p>Diarrhea in the last two weeks</p>

In each box, there are two sets of variables, one along the left and the other set along the top. For example, in Box 10.1, variables representing household-level resources are on the left, and variables representing caregiver resources are along the top. Statistically significant and meaningful associations between a variable on the left side and another along the top are represented by a “+”, a “-” or a “*”. A “+” indicates a positive relationship (for example, between the asset index and maternal education). A “-” indicates a negative relationship (for example, as the dependency ratio increases, maternal BMI declines). In cases where one or both variables are not linear or ordered (for example, main occupation) neither a “+” nor a “-” is shown. Rather a “*” represents that there was a statistically significant relationship between the two variables.

10.3.1 Associations between household resources and caregiver resources

Because of the large number of variables representing caregiver resources, the results in this chapter are presented using several boxes, each with the same household resources on the left, but with the following three sub-groups of maternal resources along the top: (1) Caregiver health, education, and knowledge; (2) Caregiver employment characteristics; and (3) Women’s empowerment and social support (scales).

First, however, we briefly examine the associations between household food insecurity and other household resources, as measured by partner’s education, the housing quality index, the assets index and the dependency ratio. Although household food security (or insecurity, as assessed by our index) is also a resource characteristic of the household, we examined separately the association between food insecurity and other household resources because food availability is likely to be a more proximal determinant of child feeding practices than the other household resources characteristics. Thus, it was important to understand what some of the determinants of household food availability (as measured by the food insecurity scale) might be.

Associations between household resources and food insecurity

The results presented in Table 10.2 show that food insecurity, as measured by the scale described in Chapter 6, is strongly and negatively associated with three of the four household resource indicators (partner’s education, asset index, and housing index). Food insecurity is also associated with the dependency ratio, but the relationship is not as clearly linear¹¹. The findings related to the asset and housing indices show that households in the higher terciles (i.e. who have higher socioeconomic status) scored on average one point less to the food insecurity scale (meaning that their food insecurity is less severe) than poorer households.

Table 10.2 Relationships between household resources and food insecurity

Household resource	Variable name	Food insecurity scale score	
		Mean	SD
<i>Partner’s education</i>	<i>q204n</i>	*	
- None		8.0	(1.60)
- Primary		7.8	(1.85)
- Secondary		6.8	(2.32)
<i>Asset index terciles</i>	<i>nfac1_2</i>	*	
- Low		8.2	(1.56)
- Middle		7.9	(1.71)
- High		7.3	(2.08)
<i>Housing index tercile</i>	<i>nfac2_2</i>	*	
- Low		8.2	(1.73)
- Middle		7.8	(1.69)
- High		7.4	(2.00)
<i>Dependency ratio terciles</i>	<i>ndeprati</i>	*	
- Low		7.6	(1.99)
- Middle		8.0	(1.73)
- High		7.9	(1.76)

* p<0.05

Caregiver nutrition, health, education and knowledge

Box 10.1 presents the results of the associations between household resources and caregiver nutrition, health, education and knowledge. The household asset index was positively associated with all caregiver resources, meaning that households with a higher asset base were more likely to have a better nourished and healthier caregiver, who also had more education and greater child feeding knowledge. The housing index was similarly associated with the first three maternal resources, but not with knowledge.

Greater household food insecurity was associated with poorer caregiver’s health and education, but surprisingly, it was not related to her nutritional status. Women in the highest food insecurity tercile were more likely to have no schooling than those in the

¹¹ The test for linearity was not significant when terciles were cross-tabulated; when means were compared the test for linearity was significant

lowest food insecurity tercile (54 percent versus 48 percent). Women from more insecure households were also more likely to self-rate their health lower (by a one point difference on a 10 point scale) than women from less food insecure households. We would have expected that food insecurity may have been associated with poorer nutritional status, but this association was not found.

Maternal education was strongly associated with all four household resources, and the magnitude of the differences in these resources by maternal education level was generally large. For example, among mothers with no education: 69 percent also had a partner with no education, compared to 30 percent among mothers with some education; 57 percent were in the lowest asset tercile, compared to 41 percent among mothers with some education; 61 percent were in the lowest housing tercile, compared to 37 percent among mothers with some education; and 30 percent were in the lowest food insecurity tercile compared to 51 percent among mothers with secondary schooling or higher.

**Box 10.1. Household-level resources and caregiver resources:
Nutrition, health, education, and knowledge**

Household level resources	Caregiver resources (health, education and knowledge)			
	Maternal BMI (categories)	Health self-perception (mean)	Maternal education (categories)	Knowledge of feeding (mean)
- Partner's education			+	+
- Asset index	+	+	+	+
- Housing index	+	+	+	
- Dependency ratio	-			-
- Food insecurity		-	-	

A number of the other significant differences summarized in Box 10.1 are not very large. For example, the proportion of women with low BMI (< 18.5) is 18 percent in the lowest asset index tercile and 11 percent in the highest. The difference in maternal knowledge of feeding between the lowest and highest asset index groups is only 0.1 point on a knowledge scale ranging from 0-6. Similarly, the difference in health self-perception is only 0.2 on a scale ranging from 0-10.

Finally, there were also some results that were not statistically significant but where the trend was in the expected direction. For instance, the difference in prevalence of overweight/obesity between the lowest and highest food insecurity tercile was about 6 percent with a linear trend, but this was not statistically significant.

Caregiver employment characteristics

Box 10.2 summarizes the associations between household resources and employment characteristics of the respondent, including main occupation, location of work (i.e., at home or away from home), and the time spent away from home.

**Box 10.2. Household-level resources and caregiver resources:
Caregiver employment characteristics**

Household level resources	Caregiver resources (maternal employment)				
	Employed in last 12 months	Main occupation	Location of work	How many days away? (categories)	How long when she goes? (categories)
- Partner's education		*			
- Asset index		*	*	+	+
- Housing index			*		
- Dependency ratio	+	*	*	+	+
- Food insecurity	-	*	*	-	-

Partner's education level and women's main occupation were strongly related. Women whose husbands had some secondary education (14 percent of the sample) were much less likely to mention farming as their main occupation than were women whose husbands had less education (22 percent as compared to 42 percent of those whose husbands had some primary, and 49 percent of those whose husbands had no education). They were also somewhat more likely to report not working (24 percent as compared to 14-16 percent for the other groups), possibly due to less need for them to contribute to the household finances.

The dependency ratio and the household food insecurity scale were associated with all the caregiver employment variables and the asset index was associated with all but one employment variable (whether mother was employed or not in the previous 12 months). Respondents with higher levels of food insecurity (i.e. in the highest tercile of food insecurity) had the following employment characteristics: 1) they were least likely to have been employed in the last 12 months, compared to the other two terciles of food insecurity; 2) they were less likely to be involved in market work, compared to the respondents from the least food insecure tercile; 3) they were more likely to work at home than away from home; and 4) if they did work away from home, they were more likely to do so on less than 3 days a week, compared to the less food insecure mothers. It could be that the market-based work, which keeps women away from home for longer hours and more days a week, provides a buffer for the food security situation of the household by increasing access to different markets and more income. This is also suggested by the positive association found between the asset index and the caregivers' time spent away from home for work: women who spent longer hours and more days away from home were more likely to be in the higher asset index tercile than those who worked at home or spent less time away from home.

Thus, overall it appears that the women's market activities have a protective effect on their household food security. The fact that these activities keep them away from home and, in most cases separated from their young children for extended periods of time, however, may have a negative impact on their caregiving practices and ultimately on their children's health and nutrition. These aspects are examined below.

Women's empowerment and social support

Box 10.3 summarizes the associations between household resources and various aspects of women's empowerment and available social support for women. Again, the asset index and food insecurity scale were consistently associated with most of these caregiver resources, whereas the partners' education and the housing index were associated only with a few of these practices.

The associations between the household assets index and caregiver resources related to women's empowerment and social support were all positive. For instance, women from wealthier households (i.e. in the higher asset tercile) were more likely to have access to a variety of resources such as good communication with their partners, ownership of personal assets and better access to financial and material support. They were also more likely to participate in social groups and to score higher on the life satisfaction scale, and less likely to be have symptoms of depression or stress.

For most of these maternal resources, the direction of the associations with the food insecurity scale was reversed because of the scoring of this scale (higher score means higher food **in**security). Thus, mothers in the highest food insecurity tercile were less likely to enjoy good couple communication and financial/material help or to own personal assets, they scored lower on the life satisfaction scale and they were more likely to suffer from anxiety and depression symptoms. The association between community participation and household food insecurity, however, was positive, as was the case for the association with household assets. In other words, women from more food *insecure* households reported participating in a larger number of social groups than those from less food insecure households, as were women from the highest tercile of the asset index (i.e. wealthier women). This difference might reflect that fact that social group participation is, on the one hand, easier for those with more access to wealth (as measured by the assets index), and on the other hand, *necessary* for those with less access to resources such as food (as measured by the food insecurity scale).

Associations between the dependency ratio and the women's empowerment and social support scales run counter to expectations for the most part. With the exception of financial/material help, they are consistently positive, indicating that a high dependency ratio is in fact associated with better status and support for women in this setting. This suggests that although a high dependency ratio is generally taken to represent a stress or vulnerability (lack of adult labor, earning possibilities, etc.), in this data set it is associated with some positive indicators of women's empowerment and support.

Box 10.3 Household-level resources and caregiver resources: Women's empowerment and social support

Household level resources	Caregiver resources (women's empowerment and social support)								
	Has someone to talk to (yes/no)	Couple communication (mean)	Ownership of assets (mean)	Involvement in decision-making (mean)	Anxiety/depression symptoms (mean)	Life satisfaction (mean)	Household help (mean)	Financial/material help (mean)	Community participation (mean)
- Partner's education	+					+		+	+
- Asset index	+	+	+		-	+	+	+	+
- Housing index				+			+		
- Dependency ratio			+	+			+	-	+
- Food insecurity	*	-	-	*	+	-	*	-	+

+

10.3.2 Associations between household resources and care practices

This section presents findings related to the associations between household level resources and care practices. The care practices assessed through the baseline survey are represented by a large number of variables, which for the purpose of this analysis are grouped into 6 categories: (1) Early feeding practices; (2) Feeding practices for children 18-23 months; (3) Feeding practices reflecting food choice and dietary diversity for all index children 18-47 months old; (4) Care during feeding and feeding during diarrhea; (5) Child, respondent and house cleanliness; and (6) Discipline practices. Each category of care practices is presented in a separate box, to look at their association with the same 5 types of household resources as in the previous section.

Early feeding practices

Early feeding practices refer to the following three practices: breastfeeding initiation, exclusive breastfeeding during the first day and the use of colostrums. All three of these early feeding practices were associated positively with the housing index (Box 10.4). The exact nature of this association is not clear, except that housing quality is a reflection of wealth. Partner’s education was also positively associated with two optimal early feeding practices: feeding only breast milk on the first day after birth and giving colostrums to the child. An increasing dependency ratio was also associated with some positive practices. Taken together with some of the results presented above (for example, the positive associations between the dependency ratio and maternal status/support variables), it appears that in this context the dependency ratio does not function as a proxy identifying households that are “worse off” as is often the case; relationships in our study sample seem more complex.

Household food insecurity was negatively associated with initiation of breastfeeding, such that fewer respondents in extremely food insecure households (11 percent) were likely to report initiating breastfeeding within one hour than those in less food insecure households (23 percent).

Box 10.4. Household-level resources and care practices: Early feeding practices

Household level resources	Care practices (Early feeding practices)		
	Breastfed within one hour (yes/no)	Only breast milk the first day (yes/no)	Gave colostrum (yes/no)
- Partner’s education		+	+
- Asset index			
- Housing index	+	+	+
- Dependency ratio	+		+
- Food insecurity	-		

Current feeding practices for children 18-23 months

Box 10.5 summarizes results for the age sub-group 18-23 months and includes selected variables that reflect recommended practices for this age group, namely avoidance of baby bottles, continued breastfeeding and feeding frequency. This subgroup of index children was chosen for the analysis because recommendations for these aspects of complementary feeding have been developed only for children up to the age of 24 months. After this age, the transition from complementary feeding to family diet is expected to be completed.

The recommendations against which the survey data for children 18-23 months were compared include avoidance of the use of baby bottles, continued breastfeeding, and ensuring a minimum level of adequate frequency of feeding of three meals a day¹².¹³(PAHO/WHO 2003). Because of the age restriction for this analysis (children 18-23 months of age), the sample size is much smaller than the one used for the other sets of comparisons (approximately 287 instead of 1514).

Few of the associations between household resources and care practices among 18-23 month old children reached statistical significance, probably because of the lower sample sizes. Results for bottle use, for example, showed an expected pattern, although some of the associations were not significant. In households with higher male education, higher asset index scores or higher housing quality, children were more likely to be fed using baby bottles (for example, 45 percent of children from households where the partner had some secondary education were fed with bottles, as compared to 27 percent of in households where the partner had no education).

Box 10.5. Household-level resources and care practices: Feeding practices for children 18-23 months

Household level resources	Care practices (Feeding practices for children 18-23 months)		
	No use of baby bottles (yes/no)	Still breastfeeding (yes/no)	Fed at least 3 times per day (yes/no)
- Partner's education			
- Asset index			
- Housing index	-		
- Dependency ratio			
- Food insecurity			-

¹² These recommendations assume an adequate energy-density of the diet, continued breastfeeding, and average breast milk intake. In order to maintain a sufficient sample size, however, we included all children aged 18-23 months (whether or not they were breastfed) in this analysis.

¹³ Note that, although there are currently no specific feeding recommendations for children over the age of 24 months, the use of baby bottles is discouraged at all ages in developing countries.

Household food insecurity was associated strongly and in the expected direction with the frequency of feeding; children were more likely to receive their recommended three meals a day if they were from less food insecure households than if they were from the more food insecure ones. There was, however, still a large proportion of children from the lowest food insecurity tercile who did not receive 3 meals a day (34 percent), but this percentage was much higher among the most severe food insecurity group (52 percent). Associations between the other household-level variables and continued breastfeeding or adequate frequency of feeding were not evident.

Feeding practices reflecting food choice/dietary diversity

Data on child feeding practices that reflected food choice and dietary diversity were gathered using primarily 24-hour and 7-day recalls of foods consumed from different food groups. This information is used both to represent the food choices made by caregivers and as proxies for food intake and nutrient adequacy. The associations between household resources and some of these variables are shown in Box 10.6. Data on all index children between 18 and 47 months were used for these analyses.

Box 10.6. Household-level resources and child feeding practices: Dietary diversity

Household level resources	Child feeding practices						
	No. meals in past 24 h (mean)	Dietary diversity in past 24 h (mean)	No. of ASF in past 24 h (mean)	No. of VA-rich plant foods in past 24 h (mean)	Any flesh foods \geq 3 d in past 7 d (yes/no)	Eggs \geq 3 d in past 7 d (yes/no)	Vitamin A-rich plant foods \geq 3 d in past 7 d (yes/no)
- Partner's education		+	+	+	+	+	
- Asset index	+	+	+	+	+	+	+
- Housing index	+	+	+	+			
- Dependency ratio		-	-				
- Food insecurity	-	-	-	-	-	-	-

Abbreviations: ASF = animal source foods; d = days; h = hours.

The statistically significant associations shown in Box 10.6 are all in the expected direction, with all the feeding variables strongly associated with the asset index and the food insecurity scale. A number of other associations, also in the expected direction, were found between these feeding practices and the partners' education and the housing index. Figure 10.2 illustrates some of the associations between household food insecurity and feeding practices of 18-47 month old children in the previous 24 hours. These associations are all strong, consistent, linear, and statistically significant. On average, children from more food insecure households consumed approximately 1/2 meal less per

day compared to those from less food insecure households; they were fed close to 1 less food yesterday and more importantly, 1 less animal source food, and were less likely to have been fed vitamin A-rich fruits and vegetables. The same magnitude of differences were observed when looking at the association between these practices and the asset index terciles, whereby children from wealthier households were fed a larger number of meals in the previous day and had a diet with greater diversity, especially a higher number of nutrient-dense animal-source foods.

Only dietary diversity and the number of animal source foods were associated with the dependency ratio, and again, in the expected direction, with increasing dependency ratios being associated with lower dietary diversity and a lower number of animal source foods in the past 24 hours.

Care during feeding and feeding during diarrhea

Care during feeding was assessed using a variety of questions that focused on providing assistance to children when they ate and on strategies used by caregivers to encourage children to eat when they refused food. Whether or not children are helped to eat is dependent on the child’s age, and beyond a certain age very few children are likely to be helped. Therefore responses to this question were assessed within fairly narrow age ranges (18-23 months and 24-35 months). For the strategies used by caregivers to encourage children who refused to eat, data on all index children 18-47 months were used in the analysis. The associations between household resources and care during feeding and feeding during diarrhea episodes are summarized in Box 10.7.

Box 10.7. Household-level resources and care practices: Care during feeding and feeding during diarrhea

Household level resources	Care practices (care during feeding and feeding during diarrhea)				
	Helped to eat (18-23 mo) (yes/no)	Helped to eat (24-35 mo) (yes/no)	Response to food refusal (categories)	More liquids during diarrhea (yes/no)	The same or more food (yes/no)
- Partner’s education		+			
- Asset index					
- Housing index					
- Dependency ratio					
- Food insecurity			*	-	-

Very few associations were found between household resources and the care practices examined. There were no associations or observable patterns between the asset and housing indices and either care during feeding or feeding during diarrhea. For partner’s education, only one significant relationship was observed, with more children

aged 24-35 months being fed by someone (14 percent) in households with some (male) secondary education, as compared to households with no (male) education (7 percent).

There was a significant association between household food insecurity and caregiver responses to food refusal. Caregivers in highly food insecure households were more likely to report doing nothing (29 percent) when the child refused food than those from less food insecure households (22 percent), but they were also more likely to report using positive encouragement strategies (49 percent) than those in the low food insecurity group (42 percent).

Feeding during diarrhea was assessed relative to recommendations for increased liquids and maintained (the same or more) feeding of solid foods. Only household food insecurity was significantly associated with feeding practices during diarrhea. A much larger proportion of caregivers in the low food insecurity group reported giving more liquids when their child had diarrhea than in the high food insecurity group (67 percent compared to 47 percent). A similar pattern was seen for maintaining food intake during diarrhea, with more caregivers in the low food insecurity group indicating that they gave the same amount or a larger amounts of food when their child had diarrhea (33 percent versus 39 percent).

Hygiene practices

Box 10.8 summarizes the results on the associations between household resources and hygiene practices, as measured by the hygiene scales based on spot check observation data¹⁴. Many associations between household resources and the hygiene scales are statistically significant and differences are meaningful in size.

Box 10.8. Household-level resources and care practices: hygiene practices

Household level resources	Hygiene practices			
	Child cleanliness (quartiles)	Respondent cleanliness (terciles)	House exterior cleanliness (two groups)	House interior cleanliness (two groups)
- Partner's education	+	+	+	+
- Asset index	+	+		+
- Housing index				+
- Dependency ratio	+			
- Food insecurity	-	-		-

Partner's education was positively associated with all four scales, such that higher education of the spouse was associated with overall better hygiene. The results indicate that differences in child, respondent and house interior cleanliness were particularly large

¹⁴ Note that scales were divided into different numbers of groups depending on their distributions; for example, the child cleanliness scale was divided into quartiles, mothers' cleanliness into terciles, and the house cleanliness scales into two groups.

between households where the partner had no education as compared to households where the partner had some secondary education. Child, respondent and house interior cleanliness also varied significantly between the extreme terciles of the asset index and between low and high food insecurity terciles. All three sets of comparisons are shown in Table 10.3

Table 10.3 Relationships between household-level resources and hygiene scales

Cleanliness scales	Partner's education			Asset index tercile			Food insecurity		
	None	Some primary	Some secondary	Low	Middle	High	Low	Middle	High
Child - % in highest quartile (<i>nchclea</i>)	13	15	24	11	13	21	34	31	25
Mother - % in highest tercile (<i>nmotclean</i>)	22	29	53	23	28	38	30	31	27
Interior -% in upper half (<i>nintclea</i>)	52	62	78	52	60	70	64	63	53

Discipline practices

Discipline practices were assessed by asking caregivers how often they gave their child a few “taps” and how often they hit their child, with response categories of “never” “sometimes” and “often” for each. Several significant associations were observed between household resource variables and responses to these questions, but some differences are small and are also difficult to interpret. For example, the housing index is significantly associated with each reported practice, but in opposite directions such that fewer respondents reported using taps often in the higher terciles of the housing index, but more respondents reported using hitting often in the higher terciles of the housing index. This could indicate that respondents living in better conditions use harsh methods of punishment more often than the less harsh methods. This is reflected somewhat in the significant relationship between food insecurity and the use of taps as well as well hitting. Respondents from highly food insecure households reported a more frequent use of taps than those from less food insecure households. At the same time, however, those in the more food insecure households were also more likely to report never *hitting* their children.

A more easily interpretable association was observed between the dependency ratio groups and discipline strategies. Caregivers in households with higher dependency ratios (more children per adult) were more likely to report “often” for both taps and hitting their children.

10.3.3 Associations between caregiver resources and care practices

For this analysis, we looked at the associations between seventeen caregiver resources and twenty-five proxies for intake and/or care practices. In order to summarize such a large number of comparisons, maternal resources are divided into the following two groups for presentation in the boxes: (1) Nutrition, health, education, knowledge of feeding practices, and employment; and (2) Women’s empowerment and social support

scales. The feeding practices are grouped in the same 6 categories as in the previous section.

Early feeding practices

Boxes 10.9 & 10.10 summarize associations between caregiver resources and both early feeding practices and feeding of children aged 18-23 months.

The positive associations between maternal level of education and early feeding practices are largely due to the much higher prevalence of positive practices among women with some secondary education. However, this group comprises a very small proportion of the sample (6 percent). Differences in these early practices between women with no education and those with some primary education are small and of little practical importance (for example, 61 percent of those with no education gave colostrum, as compared to 66 percent of women with some primary education; 38 percent initiated breastfeeding within the first hour, as compared to 41 percent of women with some primary education).

Associations between the feeding practices knowledge scale and early feeding practices were large and significant (see Table 10.4. Mothers who scored higher on the knowledge test (higher tercile) were more likely to have breastfed within the first hour following birth (51 compared to 34 percent among mothers who scored in the lowest tercile of the knowledge scale); they were much more likely to have offered only breast milk to the child during the first day (60 percent vs. 39 percent among mothers with poorer knowledge scores); and to have given the child the colostrums (72 vs. 58 percent among the lowest knowledge tercile group). It should be noted that the questions forming the knowledge scale did not, in fact, include any on early feeding practices. This suggests that women who scored high on the knowledge scale may have a generally higher knowledge of good feeding practices, extending beyond the particular questions in the scale. Mothers with higher knowledge were also more likely to be still breastfeeding their child and to avoid bottle feeding.

Box 10.10 shows that very few associations were found between early feeding practices and women's empowerment and social support variables, and in general the sizes of differences observed were small.

Box 10.9. Caregiver resources (maternal health, education and employment) and care practices: early feeding practices, and feeding of 18-23 month-old children

Caregiver resources (health, education & employment)	Care practices (early feeding & feeding of children 18-23 mo)					
	Early feeding			Feeding of children 18-23 mo		
	Breastfed within 1 h of birth	Only breast milk on 1 st d	Gave colostrum	No use of baby bottles	Still breast-feeding	Fed ≥ 3 times /d
- Health self-perception (terciles)						+
- Level of education (categories)	+	+	+	+		
- Knowledge of feeding practices (terciles)	+	+	+	-	+	
- Employed (yes/no)			+			
- Away three days/week or more? (yes/no)			+	-		
- Away more than one day when she goes?						

Box 10.10. Caregiver resources (women's empowerment and social support) and care practices: early feeding practices, and feeding of 18-23 month old children

Caregiver resources (empowerment and support)	Care practices (early feeding & feeding of children 18-23 mo)					
	Early feeding			Feeding of children 18-23 mo		
	Breastfed within 1 h of birth	Only breast milk on 1 st d	Gave colostrum	No use of baby bottles	Still breast-feeding	Fed ≥ 3 times/d
Couple communication (terciles)						
Control over purchases (terciles)						
Ownership of assets (lower vs upper half)						
Involvement in decision-making (terciles)	+	+	+			
Anxiety/depression symptoms (terciles)			+			
Time stress (terciles) (-6)						
Life satisfaction (terciles)						
Household help (terciles)						
Financial/material help (lower vs upper 1/2)				-		
Community participation (lower vs upper 1/2)	+	+	+	+		

Table 10.4 Relationship between maternal knowledge of feeding practices, early feeding and feeding of children 18-23 months

Feeding practices	Knowledge of feeding practices (terciles)		
	Low	Middle	High
Early feeding practices (maternal recall)	(n ≈ 1514)		
- Breastfed within one hour of birth (<i>bf1hr</i>)	34	36	51
- Only breast milk the first day (<i>q315a</i>)	39	42	60
- Gave colostrums (<i>q316</i>)	58	62	72
Current practices: Children 18-23 months	(n ≈ 287)		
- Does not usually feed child with bottle (<i>q319</i>)	67	72	55
- Still breastfeeding (<i>q317</i>)	27	37	43
- Frequency of feeding ≥ 3 times/day (<i>mealad</i>)	61	60	59

Current feeding practices for children 18-23 months

As seen in many developing country contexts, bottle feeding use was associated with higher maternal education level: 60 percent of women with higher education level reported using baby bottles (67 percent), compared to 44 percent among women with some primary schooling and 27 percent among those who have no education. Bottle use was also positively associated with a variety of indicators of socio-economic status, including housing quality, asset index and partner's education, but only the association with housing quality reached statistical significance (see Box 10.5).

Maternal education was not associated with the other two feeding practices examined for 18-23 month old children, i.e. continued breastfeeding and appropriate feeding frequency in the previous 24 hours. Greater maternal feeding knowledge, however, was associated with both greater use of baby bottles and a higher likelihood of continued breastfeeding (see Table 10.4). Interestingly, feeding knowledge was the only variable – among all comparisons made – significantly associated with a higher likelihood of continued breastfeeding for children 18-23 months. No association was seen between knowledge of feeding practices and frequency of feeding, however, even though this was one of the three components of the knowledge scale.

Few of the women's empowerment and social support scales were associated with current feeding for ages 18-23 months (see Box 10.10 above). Only community participation and financial/material help were significantly associated with the use of baby bottles, but the magnitudes of differences were small and probably of little significance. The associations, however, were in the same direction as socioeconomic variables, greater financial and material help and participation in community activities were associated with greater use of baby bottle.

Feeding practices reflecting food choice & dietary diversity

Box 10.11 summarizes the associations between caregiver resources such as self-rated health, education, knowledge and employment, and feeding practices reflecting food choice and dietary diversity for all index children between 18 and 47 months of age. The most striking results are that maternal education is consistently and positively associated with all child feeding practices; and dietary diversity is associated with all maternal resources related to health, education, knowledge and employment.

Figure 10.3 illustrates the association between maternal education and some of the feeding practices examined. As expected, children whose mothers are more educated are fed a larger number of meals on average and they have a more diverse diet, especially with respect to intake of animal source foods, compared to mothers with no education. Children of mothers with secondary school level or higher consume on average one more food group overall, and 1 more animal source food, compared to children of mothers with no education. Children of more educated mothers were also much more likely to have consumed meat products at least 3 times in the previous week (50 percent), compared to those with non-educated mothers (31 percent); and eggs (22 percent among more educated compared to 6 percent among non educated mothers) (not shown).

Maternal feeding knowledge and employment were both associated with greater dietary diversity and intake of a larger number of animal source foods in the previous 24 hours. Dietary diversity was associated positively not only with whether a woman was employed or not, but also with the number of days she worked away from home, and the amount of time during the day that she spent away from home. These findings concur with the findings described above, which showed that women's employment and number of days away from home are positively associated with greater household food security. It seems like the greater household food security among women who are engaged in market activities away from home, also translates into better quality diets for their young child.

Box 10.12 shows the associations between women's empowerment and social support variables and these same child feeding practices reflecting food choice and dietary diversity. For the variables listed in Box 10.12, there were a number of significant associations that reflect very small differences, and are of questionable practical significance. In order to present a clearer picture of the more important associations, only differences of ≥ 0.2 were included for number of meals and for number of food groups yesterday; also, non-linear (U-shaped) relationships are not included.

Maternal ownership of assets, financial/material help and anxiety/depression, followed by control over purchases were the resources most consistently associated with child feeding practices (each was associated with 4 or 5 of the 7 practices listed in Box 10.12). All associations were in the expected direction: positive maternal resources such as control over resources and help received were associated with better child feeding practices, and maternal stress/anxiety was associated with poorer feeding practices. This negative association is expected because the scale is in the opposite direction to the others; that is low scores indicate fewer symptoms of stress and anxiety, whereas on all other scales, higher scores represent more resources.

As shown above for the first set of maternal resources, dietary diversity and intake of animal foods were associated with a wide range of the women's empowerment and social support scales, for example with couple communications, control over purchasing, ownership of assets, life satisfaction, household help, financial and material support, and community participation. Both feeding practices were also negatively associated with the maternal anxiety and depression scale. As shown previously (section 10.3.2), these same feeding practices were also associated with household resources (particularly the asset scale and household food insecurity). Future analyses will, therefore, evaluate these associations when controlling for factors such as household SES and also examine any possible interactive relationships among these variables.

Box 10.11. Caregiver resources (maternal health, education, and employment) and child feeding practices: food choices and dietary diversity

Caregiver resources (health, education & employment)	Child feeding practices reflecting food choice and dietary diversity						
	Number of meals in past 24 h (mean)	Dietary diversity in past 24 h (mean)	Number of animal source foods in past 24 h (mean)	Number of Vit. A-rich plant foods in past 24 h (mean)	Any flesh foods ≥ 3 days in last 7 days (yes/no)	Eggs ≥ 3 days in last 7 days (yes/no)	Vit.A-rich plant foods ≥ 3 days in last 7 days (yes/no)
- Health self-perception (terciles)	+	+	+	+			
- Level of education (categories)	+	+	+	+	+	+	+
- Knowledge of feeding practices (terciles)			+				-
- Employed (yes/no)		+	+				
- Away three days/week or more? (yes/no)							-
- Away more than one day when she goes?	+						
							+
							+

Box 10.12. Caregiver resources (women’s empowerment and support) and child feeding practices: food choices and dietary diversity

Caregiver resources (status and support)	Child feeding practices: food choice and dietary diversity						
	Number of meals in past 24 h (mean)	Dietary diversity in past 24 h (mean)	Number of animal source foods in past 24 h (mean)	Number of Vit. A-rich plant foods in past 24 h (mean)	Any flesh foods ≥ 3 days in last 7 days (yes/no)	Eggs ≥ 3 days in last 7 days (yes/no)	Vit. A-rich plant foods \geq 3 days in last 7 days (yes/no)
- Couple communication (terciles)			+	+		+	
- Control over purchases (terciles)			+			+	+
- Ownership of assets (lower vs. upper half)	+		+		+	+	+
- Involvement in decision- making (terciles)	+					+	
- Anxiety/depression symptoms (terciles)	+	-	-		-		-
- Time stress (terciles)							
- Life satisfaction (terciles)			+			+	
- Household help (terciles)			+			+	
- Financial/material help (lower vs. upper half)			+		+	+	+
- Community participation (lower vs. upper half)	+		+			+	

+

+

Care during feeding & feeding during diarrhea

Boxes 10.13 and 10.14 show associations between caregiver resources and both care during feeding and feeding during diarrhea. Overall, relatively few associations were observed between caregiver resources and these practices. As with previous comparisons, some significant differences were of small magnitude (for example, differences of 2-5 percent in responses to the child’s refusal of food), and are therefore not shown in the Boxes.

Box 10.13. Caregiver resources (maternal health, education, and employment) and care practices: care during feeding, and feeding during diarrhea

Caregiver resources (health, education & employment)	Care practices (care during feeding & feeding during diarrhea)				
	Care during feeding			Feeding during diarrhea	
	Helped to eat (18-23 mo)	Helped to eat (24-35 mo)	Response to food refusal (categories)	More liquids during diarrhea	Same or more food
- Health self-perception (terciles)	-		*		+
- Level of education (categories)			+	+	
- Knowledge of feeding practices (terciles)			+	+	
- Employed (yes/no)				+	
- Away three days/week or more? (yes/no)				+	
- Away more than one day when she goes?					

Maternal education was significantly associated with caregiver responses to child refusal of food, and feeding more liquids to a child sick with diarrhea.

Few significant differences in practices were seen between women with low or high knowledge of feeding practices, although women with high knowledge scores were more likely to report giving more liquids to the child during diarrhea. They were also somewhat less likely to report taking no action when children refused food, and more likely to report caressing, playing or using other encouragement strategies.

There is a large and negative association between maternal self-rated health and helping children to eat at age 18-23 months. Only 17 percent of women in the highest tercile for health self-perception reported their child was helped to eat, as compared to 30 percent of women in the lowest tercile. Women in the highest tercile for health self-perception were also more likely to report doing nothing when children refuse food. One possible explanation for this is that women who perceive themselves as healthier also have children who are – or who are perceived to be – healthier and less in need of help/intervention with feeding. This possibility is supported by the fact that average child appetite scores (reflecting maternal perception of child appetite) also increase with women’s health self-perception terciles (average scores of 5.9, 6.3, and 7.3 on a scale of 1-10) (not shown).

Several empowerment and social support scales were significantly associated with children between 18-23 months receiving help with eating (see Box 10.14) even though the sub-sample in this age range was relatively small (approximately 287). Both the control over purchases scale and the life satisfaction scale were negatively associated with children receiving assistance with eating, i.e., women who are “better off” on these scales were less likely to report that their child is helped to eat. This difference was particularly large for the life satisfaction scale, with 40 percent of women in the lowest tercile reporting that their child is helped to eat, compared with 17 percent in both the middle and the highest tercile.

Conversely, the anxiety/depression symptoms scale was positively associated with a child between 18 and 23 months receiving assistance to eat. Thus, the more symptoms of anxiety a woman reported, the more likely she was to also say that her child is helped to eat. It may be that the children of these women are – or are perceived to be – less healthy and robust, and therefore more in need of help and encouragement. Consistent with this, looking across the 18-47 month age group, women with higher number of anxiety/depression symptoms are much more likely to report taking action when their child refuses to eat. A number of the other scales indicating higher status/more support (couple communication, involvement in decision-making, amount of household help, and community participation) are also associated with a higher likelihood of using responsive methods to encourage children to eat (caressing, playing, offering other food).

The relationships between self-rated health as well as anxiety/depression and caregiver responses to feeding children all speak to the complexity of assessing responsive feeding behaviors and interpreting the implications of these behaviors. Clearly, caregiver behaviors around feeding children appear to be driven by their perceptions of what their children’s needs are, and as previously documented in other cultures, women who appear to engage in responsive feeding behaviors appear to be compensating for perceptions about child weaknesses rather than being active feeders.

Very few associations were seen between women’s empowerment and social support and feeding during diarrhea, and results were not consistent. Only the life satisfaction scale was positively associated with both increased liquids and maintained feeding during diarrhea.

Box 10.14. Caregiver resources (women’s empowerment and support) and care practices: care during feeding, and feeding during diarrhea

Caregiver resources (status and support)	Care practices				
	Care during feeding			Feeding during diarrhea	
	Helped to eat (18-23 mo)	Helped to eat (24-35 mo)	Response to food refusal (categories)	More liquids during diarrhea	Same or more food
- Couple communication (terciles)			*		
- Control over purchases (terciles)	-				+
- Ownership of assets (lower vs upper half)					
- Involvement in decision-making (terciles)			*	-	
- Anxiety/depression symptoms (terciles)	+	+	*		
- Time stress (terciles) (-6)			*		
- Life satisfaction (terciles)	-		*	+	+
- Household help (terciles)			*		
- Financial/material help (lower vs. upper half)					
- Community participation (lower vs. upper half)			*		

Hygiene practices

Box 10.15 documents the associations between the first set of caregiver resources (nutrition, health, education and employment), and hygiene practices and discipline practices. Positive and consistent associations were seen between maternal education and the hygiene scales, as assessed by the spot check observations, as well as between feeding knowledge and the hygiene scales.

Box 10.15. Caregiver resources (maternal health, education, and employment) and care practices: hygiene and discipline practices

Caregiver resources (health, education & employment)	Care practices (Hygiene and discipline practices)					
	Hygiene practices				Discipline practices	
	Child cleanliness (quartiles)	Respondent cleanliness (terciles)	House exterior cleanliness (two groups)	House interior cleanliness (two groups)	Use taps	Hit child
- Health self-perception (terciles)			-			+
- Level of education (categories)	+	+	+	+		-
- Knowledge of feeding practices (terciles)	+	+	+	+		*
- Employed (yes/no)	+				-	+
- Away three days/week or more? (yes/no)	+			+		
- Away more than one day when she goes?						

Box 10.16. Caregiver resources (women’s empowerment and social support) and care practices: hygiene practices, and discipline practices

Caregiver resources (empowerment and support)	Care practices (hygiene practices and discipline)					
	Hygiene practices				Discipline practices	
	Child cleanliness (quartiles)	Respondent cleanliness (terciles)	House exterior cleanliness (two groups)	House interior cleanliness (two groups)	Use taps	Hit child
- Couple communication (terciles)	+	+	+	+	+	+
- Control over purchases (terciles)	-	-	-	-	+	
- Ownership of assets (lower vs upper half)	+	+	+	+	+	
- Involvement in decision-making (terciles)					-	*
- Anxiety/depression symptoms (terciles)					+	+
- Time stress (terciles)	- +			-	+	+
- Life satisfaction (terciles)					+	
- Household help (terciles)	+	+		+	+	
- Financial/material help (lower vs. upper half)					+	
- Community participation (lower vs. upper half)					+	+

Box 10.16 shows associations between the second set of caregiver resources (women's empowerment and social support) and hygiene practices. A number of scales were positively associated with the hygiene scales, for instance, the scales that assessed couple communications, ownership of assets, involvement in decision-making, and household help. There were more differences for the personal cleanliness scales (child and mother) than for the household/compound cleanliness scales, and differences tended to be slightly larger for personal cleanliness as well.

The scale reflecting maternal control over purchases was consistently and *negatively* associated with all four hygiene scales. In order to understand why a higher level of control over purchases would be associated with poorer hygiene, we compared dependency ratios, help with tasks, and sex of household head for households where women scored low, middle, and high for control over purchases. No differences were seen in dependency ratios or in the amount of (unpaid) help available, but there were many more female-headed households in the highest tercile for control over purchases. Among households where women had low control over purchases, only 3 percent were female-headed, but in the highest tercile of control over purchases, up to 22 percent of households were female-headed. These households may be different in a number of ways, particularly in that the female heads of households possibly have to pay more attention to activities such as income-generation rather than household hygiene.

Discipline strategies

Boxes 10.15 and 10.16 also present associations between caregiver resources and the discipline strategies used by the respondents. Several maternal variables were negatively associated with giving "taps" but positively associated with hitting, suggesting the use of harsher discipline strategies. A comparison of discipline strategies between feeding knowledge groups shows that women with low knowledge are both more likely to report "never" hitting but also slightly more likely to report "often" hitting. The chi-square test for this association was significant, but it is not clear how these results should be interpreted.

A number of the women's empowerment/support scales were also positively associated with frequency of giving "taps" or hitting the child. For giving "taps", differences of 10-12 percent in responses of "often" were seen between low and high groups for couple communication, control over purchases, and community participation. Differences of this magnitude were also seen with the scales that assessed symptoms of anxiety and stress and of time stress; as stress increased, the proportion of women reporting the use of taps "often" increased. Fewer and smaller differences were seen between groups when considering the proportion that reported hitting their child "often". The exception to this is the time stress scale: those scoring in the highest tercile for time stress were twice as likely to report hitting their child "often" than were women in the lowest tercile for time stress (22 percent in the highest tercile vs. 11 percent in the lowest).

10.3.4 Associations between household resources and child outcomes

In the conceptual model, the effects of resources (household and maternal), access to food and the health environment on child outcomes flow through the proximate determinants: food intake and child health. However, for the purposes of understanding relationships in this data set, it is useful to first examine associations between elements at all levels of the model with child outcomes. In the UNICEF model, the “outcomes” are survival, growth, and development. In our analyses we use children’s anthropometric measurements as reflecting child growth. We also examine the relationships between resources and child health outcomes as defined by the prevalence of diarrhea in the 2 weeks preceding the survey, and results to the visual child health analogue scale, which represent the caregiver’s perception of her child’s health compared to other children the same age (see chapter 4).

Box 10.17 summarizes these associations. Both the asset and the housing indices were associated with some of the child anthropometric and health outcomes in the expected direction. Children from households with greater asset base and who had better housing conditions had a better nutritional status, were less likely to have had diarrhea in the previous 2 weeks (true only for the asset index) and scored higher to the health analogue scale (true only for housing index). With respect to nutritional status, the strongest associations were between the asset and housing indices and height-for-age z-scores (HAZ) (see Table 10.5); the magnitude of the difference between the lowest and highest terciles for both these indices and HAZ was greater than 0.2 z-scores.

Household food insecurity was not associated with children’s nutritional status, but was strongly associated with greater likelihood of the child having had diarrhea in the previous 2 weeks and with a poorer score on the health analogue scale (see Table 10.5). Up to 39 percent of children from the most food insecure households (highest tercile) had had diarrhea in the previous 2 weeks compared to 28 percent among the less food insecure.

Partner’s education and dependency ratio were not significantly associated with any of the anthropometric and health outcomes, although some linear relationships were found between the dependency ratio terciles and HAZ and WAZ (positive) and between partner’s education and diarrhea. This latter association was in the opposite direction than expected, with children in households where the partner had no education having being less likely to have had diarrhea in the previous week (29 percent) compared to those where the partner had some secondary education (38 percent). This association is not easily interpretable.

Box 10.17. Household-level resources and child anthropometry and health outcomes

Household resources	HAZ	WAZ	WHZ	Diarrhea	Child health analogue scale (mean)
- Partner's education					
- Asset index	+	+		-	
- Housing index	+	+	+		+
- Dependency ratio					
- Food insecurity				+	-

Table 10.5. Relationships between household resources and child anthropometry and health outcomes

Household resources	Mean z-scores			Diarrhea (%)	Child health scale (mean)
	HAZ (mean)	WAZ (mean)	WHZ (mean)		
Partner's education (<i>q204n</i>)				§	
- None					
- Some primary	-1.34	-1.27	-0.53	28.9	6.44
- Some secondary	-1.44	-1.26	-0.52	33.6	6.47
	-1.24	-1.08	-0.38	37.6	6.61
Asset index (terciles) (<i>nfac1_2</i>)	*	*		*	
- Low	-1.45	-1.29	-0.51	34.4	6.50
- Middle	-1.40	-1.30	-0.57	33.8	6.42
- High	-1.25	-1.12	-0.43	27.7	6.60
Housing index (terciles) (<i>nfac2_2</i>)	*	*	*		*
- Low	-1.49	-1.36	-0.58	29.9	6.28
- Middle	-1.42	-1.27	-0.51	34.2	6.51
- High	-1.19	-1.09	-0.42	31.8	6.73
Dependency ratio (terciles) (<i>ndprati</i>)					
- Low	-1.31	-1.17	-0.48	34.2	6.48
- Middle	-1.32	-1.21	-0.49	32.4	6.50
- High	-1.46	-1.32	-0.54	29.7	6.54
Food insecurity scale (terciles) (<i>nfdinsec</i>)				*	*
- Low	-1.33	-1.21	-0.51	28.0	6.65
- Middle	-1.34	-1.22	-0.52	30.4	6.46
- High	-1.44	-1.29	-0.47	38.7	6.30

*p < .05 (ANOVA); § ANOVA: test of linearity < 0.05

10.3.5 Associations between caregiver resources and child outcomes

Box 10.18 summarizes the associations between all caregiver resources and child anthropometry, diarrhea and perceived health. Details about some of some of these associations are also presented in Tables 10.11 and 10.12

Caregiver education was associated with HAZ and WAZ, but contrary to expectations, it was not associated with diarrhea or perceived child health. Also, the difference is only seen at the highest education level, which, as noted earlier, includes only a small proportion of the respondents. A strong association is seen between maternal BMI and the two weight related indicators (WAZ and WHZ) (see Table 10.6), in the expected direction; mothers with higher BMI had children with higher WAZ and WHZ. There was also a linear association between BMI and children's diarrhea, whereby children whose mothers were in the lowest BMI tercile were more likely to have suffered from diarrhea in the previous 2 weeks (36 percent) than children whose mothers were in the normal BMI category (32 percent had diarrhea), or in the overweight/obese category (27 percent had diarrhea).

Women's health self-perception and knowledge of child feeding were not significantly associated with child nutritional status outcomes, except for WHZ, which showed a significant linear trend. Mothers with greater feeding knowledge had children with higher WHZ. Maternal perception of her own health was associated both with diarrhea and with her perception of her child's health. Mothers in the highest health self-perception tercile scored their child's health higher (analogue scale) than mothers from the two lower terciles. An intriguing finding, however, was the higher prevalence of child diarrhea among mothers who perceived *themselves* as being healthier than other women their age. The finding was also surprising, given that these same children (whose mothers were in the higher self-perceived health tercile), were also scored significantly higher on the child health scale by their mother (as indicated above).

No associations between the maternal occupation variables and child diarrhea or the health analogue scale were seen. Some slight differences in nutritional status were seen by the mother's main occupation, but they were relatively small and non significant. For example, mothers who engage in market work for income-generation have slightly better nourished children than women working in farming, but, with the exception of WAZ, the differences were not statistically significant. Considering the positive association described above between greater household food security and women's employment in market activities on the one hand, and between market work and greater child dietary diversity, we had hypothesized that market work may be associated with better child nutritional status.

There were also no differences in child nutritional status, diarrhea or health by the location of maternal work (at home or away), the number of days/week away from home, or the amount of time absent (half day or less vs. whole day or more each time she goes).

Few significant associations were found between women's empowerment and social support and child outcomes (see Box 10.17; and Table 10.7 for selected results of significant associations).

No associations were observed between any maternal status/support scale and HAZ, and no associations were observed between any of the nutritional status outcomes and the scales that assessed couple communication, anxiety/depression symptoms, time stress, life satisfaction, household help, financial/material help, and community participation. Only ownership of assets, control over purchasing and women's involvement in decision-making were weakly associated with WAZ and/or WHZ.

Box 10.18. Caregiver resources and child anthropometry and health outcomes

Caregiver resources	Mean z-scores			Diarrhea (%)	Child health analogue scale (mean)
	HAZ	WAZ	WHZ		
<i>Nutrition, health, education and knowledge</i>					
- Maternal BMI		+	+		
- Health self-perception				+	+
- Education	+	+			
- Knowledge of feeding					
<i>Employment</i>					
- Employed in past 12 mo					
- Main occupation		*			
- Location of work					
- How many hours away?					
- How long when she goes?					
<i>Women's empowerment and support</i>					
- Couple communication					
- Ownership of assets		+	+		
- Control over purchases			-		
- Involvement in decision-making			+		
- Anxiety/depression				-	-
- Time stress					-
- Life satisfaction					+
- Household help					
- Financial/material help					+
- Community participation					

Table 10.6. Relationships between caregiver resources (nutrition, health, education, knowledge and employment) and child anthropometry and health outcomes

Caregiver resources	Mean z-scores			Diarrhea (%)	Child health scale (mean)
	HAZ (mean)	WAZ (mean)	WHZ (mean)		
Mother's BMI (<i>cat2bmi</i>)		*	*	§	§
- Low (< 18.5)	-1.40	-1.54	-0.88	36.2	6.33
- Normal (18.5 to < 25)	-1.39	-1.24	-0.50	32.2	6.51
- High (≥ 25)	-1.19	-0.89	-0.14	27.0	6.66
Health self-perception (terciles) (<i>nq901</i>)					*
- Low	-1.42	-1.32	-0.60	27.1	5.77
- Middle	-1.35	-1.22	-0.48	29.7	6.27
- High	-1.35	-1.20	-0.46	38.7	7.25
Mother's education (<i>q207cn</i>)	*	*			
- None	-1.37	-1.26	-0.52	31.5	6.49
- Some primary	-1.41	-1.25	-0.50	31.9	6.51
- Some secondary	-0.98	-0.88	-0.30	37.8	6.66
Knowledge of child feeding (terciles) (<i>nfeedkno</i>)				§	
- Low	-1.40	-1.30	-0.56	34.0	6.46
- Middle	-1.32	-1.22	-0.51	31.6	6.61
- High	-1.38	-1.20	-0.44	30.7	6.44
Main occupation (<i>mainocc</i>)		*			
- No employment	-1.24	-1.13	-0.49	34.0	6.42
- Farms	-1.46	-1.30	-0.52	30.5	6.44
- Market/trade	-1.32	-1.20	-0.46	32.8	6.65
- Manual labor	-1.38	-1.56	-0.86	25.6	6.15
- Other	-1.27	-1.14	-0.50	37.3	6.51

* p < .05 (ANOVA); § test for linearity p < .05

The anxiety/depression and the time stress indices, however, were associated with the two health outcomes in the expected direction. Mothers in the highest terciles of anxiety/depression or time stress were more likely to have given a lower score to the health rating of their child, and their child was much more likely to have had diarrhea in the previous two weeks (Table 10.8). These associations are consistent with the food insecurity and child health and diarrhea associations described earlier, and the link between food insecurity and maternal anxiety/depression.

Table 10.7. Relationships between caregiver resources (women’s empowerment and support scales) and child anthropometry and health outcomes

	HAZ (mean)	WAZ (mean)	WHZ (mean)	Diarrhea (%)	Child health scale (mean)
Ownership of assets (lower vs upper half) (<i>nq604pos</i>)		*	*		
- Low	-1.40	-1.29	-0.55	32.8	6.46
- High	-1.34	-1.18	-0.45	31.2	6.45
Control over purchases (terciles) (<i>nq606pur</i>)			§		
- Low	-1.36	-1.19	-0.42	32.4	6.42
- Middle	-1.38	-1.27	-0.53	34.5	6.47
- High	-1.35	-1.25	-0.55	29.1	6.66
Involvement in decision-making (<i>nq615inv</i>)			*		
- Low	-1.35	-1.29	-0.59	34.2	6.47
- Middle	-1.41	-1.22	-0.42	30.8	6.48
- High	-1.34	-1.19	-0.47	30.6	6.57
Anxiety/stress scale (terciles) (<i>nq905hlt</i>)				*	*
- Low	-1.39	-1.21	-0.45	27.1	6.70
- Middle	-1.32	-1.22	-0.49	29.7	6.57
- High	-1.39	-1.19	-0.56	38.7	6.28

* p < .05 (ANOVA); § ANOVA: test for linearity p < .05

10.3.6 Associations between care practices and child outcomes

Box 10.19 summarizes findings related to the associations between the 6 categories of care practices and child nutrition and health outcomes. A description of these associations, by types of feeding practices follows.

Box 10.19. Caregiver practices and child anthropometry and health outcomes

Care practices	Mean z-scores			Diarrhea (%)	Child health scale (mean)
	HAZ	WAZ	WHZ		
<i>Early child feeding practices</i>					
- Breastfeeding within 1 hour					
- Only breastfeeding 1 st day				-	
- Gave colostrums					
<i>Feeding 18-23 month olds</i>					
- No use of bottles					
- Still breastfeeding	-	-			
<i>Food choices/dietary diversity</i>					
- Fed ≥ 3 meals yesterday				-	
- Dietary diversity	+	+			+
- Number of animal source foods in previous day					
- Child was fed chicken previous day	+	+			
- Any flesh foods ≥ 3 days in past 7 days					
- Eggs ≥ 3 days in past 7 days					
- Vitamin-A rich plant foods ≥ 3 days in past 7 days				-	+
<i>Care during feeding and feeding during diarrhea</i>					
- Child is helped to eat	-			+	
- Adverse response to food refusal		-	-		-
- More liquids during diarrhea					
- Same/more food during diarrhea			+		
<i>Hygiene practices proxy</i>					
- Child cleanliness scale		+			
- Mother cleanliness scale	+	+			
- House exterior cleanliness			+	-	
- House interior cleanliness	+	+	+		
<i>Discipline</i>					
- Small taps for discipline	-	-			
- Hits child for discipline					+

Early feeding practices

No associations were found between any of the early child feeding practices and the child nutritional status outcomes. This was expected since these early feeding practices are much less likely to have an impact on anthropometric outcomes measured later on in childhood (our index children are between 18-47 months of age) than say, in the first months. Furthermore, these practices are primarily of importance for establishing successful breastfeeding patterns, and thus for preventing child mortality, rather than to stimulate growth. An association with growth could have been found, however, if these practices had been particularly strongly correlated with other positive practices throughout early childhood. This may be the situation for exclusive breastfeeding during the first day, for instance, which is associated with a lower likelihood of the child having had diarrhea recently; among children who were exclusively breastfed on their first day, 43 percent had diarrhea in the 2 weeks prior to the interview, compared to 49 percent among those who had received other liquids on their first day. The likely explanation for this association is that failure to exclusively breastfeed the child on the first day may reduce the chances that a mother will exclusively breastfeed thereafter, which in turn, can be associated with poorer growth in the short and medium term.

Current feeding practices for children 18-23 months

No significant differences in anthropometric or health outcomes were observed between children whose mothers reported using baby bottles and those who did not. Children in this age group who were still breastfed had significantly lower HAZ and WAZ, by about 0.4 z-score units. WHZ was also 0.26 units lower, but this difference were not significant, probably because of the smaller sample size used for this analysis (n=285). Lower z-scores have previously been found to be associated with the positive practice of continued breastfeeding (Marquis et al., 1997; Simondon et al., 2001). This finding has been attributed to reverse causality; that is, mothers may be more likely to continue to breastfeed more sickly and vulnerable children who are growing poorly than stronger, healthier children, thus giving rise to the negative association between continued breastfeeding and child outcomes.

Finally, children who were fed at least three meals yesterday had higher z-scores by approximately 0.12-0.14 units, but again, these differences were not statistically significant.

Feeding practices reflecting food choice and dietary diversity

Selected associations between dietary diversity variables and child anthropometric and health outcomes are shown in Table 10.8. Children who were fed less than the 3 recommended number of meals in the previous day did not have a worst nutritional status, but they were more likely to have had diarrhea in the previous 2 weeks (Table 10.8). It may be, however, that this association is due to reverse causality, whereby children who have had diarrhea recently have less appetite (or mothers withheld food) and therefore are less likely to have normal eating patterns.

Dietary diversity (or the number of food groups consumed in the previous day) was positively associated with child nutritional status (HAZ and WAZ), and with a higher reported child health score. The prevalence of stunting (HAZ < -2 z-scores) and underweight (WAZ < -2 z-scores) were also significantly associated with dietary diversity terciles. The prevalence of stunting was 34 percent among children with low dietary diversity, compared to 30 percent among those with average dietary diversity and 23 percent among those with high dietary diversity (see Figure 10.4). For underweight children, prevalences were 27, 24 and 21 percent for the lowest, middle and higher dietary diversity terciles, respectively. The association between dietary diversity and child anthropometry has been demonstrated in a number of settings and is thought to be due to the fact that as diversity increases, individuals are more likely to meet their daily nutrient requirements for a large number of essential nutrients (Arimond and Ruel 2002; Ruel 2003). Carefully conducted validation studies are still required, however, to confirm this assumption.

Another indicator of diversity, i.e. the number of animal source foods consumed in the previous day, also showed a linear trend with HAZ and with terciles of the health analogue scale (not shown). A similar pattern was observed for WAZ, but the difference was not statistically significant. It is likely that by consuming a greater variety of micronutrient-rich animal source foods, children increase their chances of meeting their daily nutrient requirements, both through greater total intake of these foods and possibly through greater variety as well. Intake of chicken in the previous day, as opposed to intake of any other animal source food, was also associated with significantly higher HAZ and WAZ. Chicken was consumed by approximately only one third of children in the sample in the previous day. The specific nature of the association between chicken intake and child growth is intriguing and will be explored in future analyses.

Intake of any flesh foods, eggs or vitamin A rich plant foods on more than 3 days in the previous week was not associated with better nutritional status. The frequency of intake of vitamin A-rich plant foods, however, was associated with lower likelihood of the child having had diarrhea in the previous two weeks and with a higher reported score on the child health analogue scale (Table 10.8).

It is important to recognize that the findings related to associations between dietary diversity indicators and child outcomes are highly susceptible to confounding factors and thus, bivariate associations should be interpreted with caution. For example, we have shown in Chapter 8 that dietary diversity and the likelihood of consuming animal source foods in particular, increases with child age in this population. At the same time, child nutritional status generally improves after 24 months, as do the child health analogue scores (see Chapter 4). Thus, the associations found between dietary diversity indicators and child outcomes may be confounded by age. Similarly, we have shown above that a number of household and caregiver resources, including the asset index and maternal education, were significantly associated with both dietary diversity and child outcomes. For these reasons, it will be particularly important to conduct multivariate analyses of the data to explore the mechanisms that explain these associations and to disentangle the effects of different factors on child outcomes.

Table 10.8. Relationship between dietary diversity (yesterday) and child anthropometric and health outcomes

	HAZ	WAZ	WHZ	Diarrhea (%)	Child health scale (mean)
Dietary diversity yesterday (terciles) (<i>ddterc</i>)	*	*			*
- Low	-1.47	-1.30	-0.52	31.2	6.33
- Middle	-1.38	-1.30	-0.55	35.1	6.45
- High	-1.27	-1.15	-0.46	31.0	6.68
Number of animal source foods consumed (<i>asfgr</i>)	§				§
- 0	-1.44	-1.30	-0.51	29.7	6.32
- 1-2	-1.43	-1.27	-0.49	30.6	6.46
- 3-6	-1.28	-1.19	-0.51	34.0	6.60
Child consumed chicken in previous day (<i>chicken</i>)	*	*			
- No (n=1123)	-1.44	-1.29	-0.52	31.2	6.49
- Yes (n=376)	-1.15	-1.09	-0.46	34.5	6.55
Child consumed vitamin A-rich plant foods \geq 3 days in previous week (<i>orange3d</i>)				*	*
- No	-1.36	-1.23	-0.49	36.9	6.36
- Yes	-1.37	-1.24	-0.51	29.7	6.57

* p < .05 (ANOVA); § ANOVA: test for linearity p < .05

Care during feeding & feeding during diarrhea

Since children are not usually assisted with eating beyond a certain age, we examined associations between self-feeding and z-scores within narrow age ranges (18-23 months, and 24-35 months). In both age groups, children who were helped to eat had lower z-scores, though the difference is significant only for the older children (with a larger sub-sample). The size of the difference is substantial in this age group (about 0.4 z-score units for HAZ and about 0.3 units for WAZ). Children who were helped to eat also were more likely to have had diarrhea in the previous 2 weeks (and possibly less appetite). Again, these findings might reflect compensatory behaviors where mothers and other caregivers are more concerned about smaller children or children who have been sick recently, and therefore pay more attention to assisting them while they eat.

Similar associations were seen between responses to food refusal and child WAZ and WHZ, particularly when the entire range children 18-47 months was included in the analysis. Children whose mothers reported using “aversive” methods (threatening, forcing) had significantly lower z-scores, by approximately 0.2 units and also had lower

health scores on the visual analogue scale. One explanation for this may be that mothers are most concerned to feed these thinner and less healthy children and therefore, use stronger tactics to get them to eat than mothers of healthier children who do not have to resort to more aversive methods.

There was no association between giving increased liquids during diarrhea and anthropometric outcomes among children who had recently had diarrhea. On the other hand, maintaining feeding during diarrhea (offering the same or more food) was associated with greater WHZ among children who had recently had diarrhea, with a difference of 0.18 z-scores between the two groups. This suggests that maintaining feeding during episodes of diarrhea can be effective in preventing wasting. Alternatively, it could also be related to the severity of diarrhea, where children who had more severe episodes of diarrhea also had poorer appetites, could not be fed adequately and therefore lost weight (and had lower WHZ scores when measured). No associations were found between feeding practices during diarrhea and recent diarrhea episode or health scale scores.

Hygiene practices

The associations between the hygiene scales and child anthropometry are shown in Table 10.9. Child cleanliness was associated with a small difference (0.1 z-scores) in WAZ between children in the lowest and highest quartile of the scale, and no significant differences in HAZ or WHZ, diarrhea or child health scores. Maternal cleanliness was associated with HAZ and WAZ and there was a linear trend with WHZ. The difference in HAZ and WAZ between the lowest and highest terciles of maternal cleanliness was a little less than 0.2 z-scores, and for WHZ it was 0.13 z-scores.

The cleanliness of the exterior of the house was associated with higher WHZ and with less diarrhea among children; children who lived in a house that scored higher on the exterior cleanliness scale were less likely to have had diarrhea (30 percent) in the previous 2 weeks than those who lived in a house that scored in the lower half (35 percent). Finally, strong associations were found between cleanliness inside the house and all three indicators of nutritional status, with differences of about 0.2 z-scores between the lower and upper half of the cleanliness scale. Surprisingly, house hygiene was not associated with diarrhea or the child health score.

Discipline practices

No differences in child anthropometry were observed between children whose mothers reported that their youngest child was never, sometimes, or often hit. Children whose mothers reported that they “never” gave their child a “tap” had markedly lower HAZ and WAZ than children whose mothers reported “sometimes” or “often”. However, only a very small proportion of mothers responded “never” to this question (3 percent). As indicated previously, this question was not asked in relation to the index child, but as a behavior that the respondent engaged in, and as such, associations with child outcomes can be expected to be less strong. Further, it is more likely that the use of harsh physical

punishment has an impact on child emotional and social wellbeing, rather than indicators of physical wellbeing such as anthropometry.

Table 10.9. Relationships between hygiene variables and child anthropometry

Hygiene scales	Child anthropometry		
	Height-for-age z-scores (mean)	Weight-for-age z-scores (mean)	Weight-for-height z-scores (mean)
Child cleanliness (<i>nchclea</i>)		*	
- Lowest quartile	-1.38	-1.21	-0.44
- Highest quartile	-1.21	-1.11	-0.45
Mother cleanliness (<i>nmotclea</i>)	*	*	§
- Lowest tercile	-1.39	-1.28	-0.55
- Highest tercile	-1.25	-1.12	-0.42
Exterior (compound) cleanliness (<i>nextclea</i>)			*
- Lower half	-1.39	-1.30	-0.59
- Upper half	-1.35	-1.20	-0.47
Interior cleanliness (<i>nintclea</i>)	*	*	*
- Lower half	-1.47	-1.35	-0.58
- Upper half	-1.30	-1.15	-0.43

* $p < .05$ (ANOVA); § ANOVA, test for linearity < 0.05 .

10.4 Conclusions

This chapter used the conceptual framework outlined in Chapter 2 to bring together the data on household and caregiver resources with the findings related to care practices and child outcomes. This was done by exploring bivariate associations between these different levels of the conceptual framework, with the primary objective of the explorations being to identify associations that will later be examined in greater depth using more sophisticated statistical analyses.

Our findings related to the associations between household resources such as assets, housing quality and food insecurity, and caregiver resources such as nutrition, health, education and women's empowerment and social support revealed a number of significant and meaningful associations. Most of the associations were in the expected direction, with caregivers living in households with greater access to resources being

better nourished, healthier and better educated, and enjoying a higher status in their households and more social support. Household food insecurity was associated with all other household resources and with most of the caregiver resources examined. Highly food insecure households had fewer assets, poorer housing quality, lower partner's education and a higher dependency ratio. Caregiver resources were also more limited in highly food insecure households: compared to more food secure households, caregivers in highly food insecure households tended to have lower levels of education, were more likely to work in farming than in the markets, and they were less likely to own personal assets and to enjoy good couple communication and support from their family. Caregivers from highly food insecure households were also significantly more likely to suffer poorer physical and mental health, as seen by their lower scores on the self-reported health scale and their higher scores on the anxiety/depression and time stress scales.

It is important to mention, however, that our measure of household food insecurity is an experiential measure, and thus, could have captured a variety of coping behaviors that in fact led to the higher levels of stress experienced by the survey respondents. The strong relationship between the two sets of variables could also reflect the extreme level of food insecurity in these communities and the impact it has on the daily lives of the survey respondents. The exact directionality of effects in this case is not clear and is likely to be truly bi-directional.

A number of associations were also seen between household resources and care practices, and between caregiver resources and care practices. As could be expected, household resources, and especially household food insecurity were more closely associated with care practices related to child feeding, particularly the practices that reflected food choice and dietary diversity. These practices are more likely to be directly affected by fluctuations in food security than breastfeeding or practices related to care during feeding for example.

As documented in studies in other contexts, the strongest and most consistent determinant of care practices in this study was maternal education (Armar-Klemesu et al. 2000), which was associated with practices from all six care categories studied. Caregiver feeding knowledge was also associated with a number of positive practices, including optimal early feeding practices, dietary diversity, positive response to child food refusal, increasing liquids during diarrhea, and hygiene practices. Note that the feeding knowledge questionnaire focused on breastfeeding duration, the timing of introduction of complementary foods and feeding frequency. Although the instrument did not include questions related to early feeding practices, dietary diversity, feeding during diarrhea or hygiene practices, it appears that mothers who have greater knowledge of some feeding practices are probably better informed about a number of other dimensions of child feeding and are more knowledgeable about child care practices in general.

Maternal employment was associated positively with a few child care practices, including greater dietary diversity, better feeding practices during diarrhea (more liquids) and child cleanliness. Our study, however, provides no evidence to support commonly held views that maternal employment has negative effects on child care practices, since

none of the maternal employment characteristics were associated with any negative care practices.

A variety of women's empowerment and social support variables were also associated with feeding practices, and again the associations were more consistent with feeding practices related to food availability and access, such as dietary diversity and the use of animal source foods in the child's diet. Hygiene practices were also related positively with couple communication, ownership of assets and household help. An unexplained negative association was found between the caregivers' control over purchases and hygiene.

Maternal anxiety/depression was negatively associated with five of the seven feeding practices related to food choices and dietary diversity. Mothers who were in the highest tercile of the anxiety/depression scale were less likely to have fed their child three meals in the previous day compared to mothers with fewer anxiety/depression symptoms; the diet of their child was also less diverse, and the child was less likely to have been fed nutrient-rich (and expensive) foods such as flesh foods and vitamin A-rich foods 3 times or more in the previous week. Clearly, these findings are related to the food insecurity and caregiver anxiety/stress associations, and the food insecurity and child dietary diversity associations described above. Taken together these findings indicate that severe food insecurity, or reduced access to food, affects women's physical and mental health and also affects their ability to provide their family and particularly their young child, with a high-quality diet. Thus, food insecurity in this population is severe and has far reaching consequences for families, and especially so for their most vulnerable members – women and young children.

Other associations were found between the anxiety/depression symptoms scale and child care. These include the positive associations with a child between 18 and 23 months receiving assistance to eat and the caregiver taking action when the child refuses to eat. These associations also suggest that mothers from the highest tercile of the anxiety/depression scale may be more concerned about their child's diet (if food is scarce and/or the child is perceived less healthy or growing poorly), and therefore they respond by being more active feeders. Active response to the child's food refusal is also positively associated with a number of the women's empowerment and support scales as are discipline strategies such as giving taps and hitting the child.

Children's nutritional status and health were associated with a number of household and caregiver resources as well as with selected care practices. The strongest positive associations with HAZ (≥ 0.2 z-scores) were observed for the asset and housing indices, maternal education, and some of the dietary diversity indicators. Similar patterns were observed for WAZ. Differences in WHZ were generally of smaller magnitude and were significant only for a few resources such as the housing index, maternal BMI and the house hygiene scales. Diarrhea and health were strongly associated with food insecurity, i.e. children from more food insecure households were more likely to have had diarrhea recently and they were also more likely to have a lower score on the health analogue scale. Few of the maternal resources were associated with child diarrhea and health, but children whose mothers were in the higher anxiety/depression and stress

terciles of the scales were more likely to have had diarrhea in the previous two weeks and to have poorer health (as perceived by the mother).

Of all the care practices studied, the diversity-related feeding practices were the practices most strongly and consistently associated with better child nutritional status and health, and with less diarrhea. A few feeding practices, namely continued breastfeeding for children 18-23 months, and being helped to eat for children 24-35 months were negatively associated with HAZ and WAZ. Also, aversive responses to food refusal (threatening, forcing children to eat, etc.) were strongly and negatively associated with WHZ. As documented previously, these negative associations could reflect reverse causality, where the positive caregiver behaviors documented in the survey were responses to poor child outcomes, rather than the negative outcomes being a result of the positive practices. All of these care practices could represent “compensatory” maternal responses to the needs of smaller or sicker children who could have been perceived to need more care and attention than bigger, more robust children.

The lack of strong associations between many of the care practices and child nutritional status in this sample is not entirely surprising because most of our index children are beyond the period of active growth faltering, which occurs mainly between 0 and 24 months of age. Thus, their current nutritional status, especially their HAZ, is largely the result of the cumulative effect of their “life” experiences, rather than merely a reflection of their current feeding and care practices. Because of the well-known difficulties of using recall methods to assess past practices, our survey, like most surveys of this type focused primarily on current practices, recognizing the potential limitations of the approach. Our survey also gathered data on younger siblings of index children (where applicable) and future analyses of the data will use a similar approach as the one described here to examine associations between care practices and child outcomes in this younger age group.

In our study, hygiene practices were weakly associated with diarrhea, with only the cleanliness of the compound being associated with reduced diarrhea rates among children in the previous two weeks.

Overall, the results of the bivariate analyses reported in this chapter provide confirmation regarding the importance and the strength of many of the hypothesized relationships between various levels of resources for care and care practices, as well as between care practices and child outcomes. At the same time the identification of these significant relationships also provides evidence that a number of the resources and care practices assessed through this baseline survey are well measured and particularly that the measures appear to tap into the larger constructs embodied in the conceptual framework.

The substantive findings reported here raise a variety of concerns, particularly about the role of food insecurity in determining the overall wellbeing of children and their caregivers in this setting. Furthermore, the relationship between caregiver resources such as feeding knowledge, and care practices, as well as the negative association between high levels of anxiety/depression among caregivers and child feeding practices point in the direction of a need to develop programs that help caregivers alleviate some of

the constraints they face in caring for their children. It is clear that ensuring caregiver access to appropriate knowledge, adequate material resources like food, and interventions that increase support and time available for child care are all necessary to promote better care and to improve children's health and nutrition in this population.

11.4.3 Caregiver resources and care practices

The caregiver characteristic most strongly and consistently associated with care practices was maternal education, which was associated positively with practices from all six categories studied. Greater caregiver feeding knowledge was also associated with a number of positive care practices, including optimal early feeding practices, greater dietary diversity, positive response to child food refusal, increased use of liquids during diarrhea and good hygiene practices.

Our data provide no evidence of a negative effect of maternal employment on child care practices, in spite of the fact that working mothers tend to leave their young child at home for extended periods of time when they work. On the contrary, maternal employment and longer absences from home were positively associated with greater dietary diversity, better feeding practices during diarrhea (more liquids) and child cleanliness. The positive associations between maternal employment and dietary diversity may reflect the fact that women whose patterns of work keep them away from home for longer hours are more likely to be the women who work in market trade and thus have better access to a wider variety of foods and possibly greater income.

A number of the women's empowerment and social support scales were associated with early feeding practices, but again the associations were stronger and more consistent with feeding practices related to food availability and access, such as dietary diversity and the use of animal source foods in the child's diet. Hygiene practices were also related positively with couple communication, ownership of assets and household help.

Maternal anxiety/depression was negatively associated with five of the seven feeding practices related to food choices and dietary diversity. Mothers who were in the highest tercile of the anxiety/depression scale were less likely to have fed their child three meals in the previous day compared to mothers in the lowest tercile, and they were less likely to feed their child nutrient-rich (and expensive) foods such as flesh foods and vitamin-A rich foods on a regular basis. Given the previously described association between severe food insecurity and maternal anxiety/depression symptoms, it seems likely that the poorer diet quality of children who have more anxious/depressed mothers is related to their more acute problem of food insecurity.

Other associations found between the anxiety/depression symptoms scale and child care provide additional support for the hypothesis of a food insecurity link in these associations. Mothers from the highest tercile of the anxiety/depression scale were more likely to help their 18-23 month old child to eat, and were more likely to take action when their child refused to eat than mothers from the other two terciles. Thus, it is likely that more anxious mothers are more concerned about their child's diet (if food is scarce and/or the child is perceived as being less healthy or growing poorly), and therefore they respond by being more active feeders. Again, this explanation is likely, given the fact that anxious/depressed mothers were more likely to be found among households in the most severe food insecurity tercile.

These complex associations will be explored more thoroughly in the future, using multivariate analyses techniques.

11.4.4 Household and caregiver resources, care practices and child outcomes

Children's nutritional status and health were associated with a number of household and caregiver resources as well as some care practices. The factors most strongly associated with HAZ were the asset and housing indices (household resources), maternal education (caregiver resources), and some of the dietary diversity indicators (care practices). Similar patterns were observed for WAZ. Differences in WHZ, however, were generally of smaller magnitude and were significant only for a few resources such as the housing index, maternal BMI and the house hygiene scales. Few of the maternal resources were associated with child diarrhea and health, but children whose mothers were in the higher anxiety/depression and stress terciles of the scales were more likely to have had diarrhea in the previous two weeks and to have poorer health. These findings, once again, suggest a potential link with food insecurity, which is confirmed by the fact that diarrhea and health were strongly associated with food insecurity in the sample; children from more food insecure households were more likely to have had diarrhea recently and they were also more likely to have a lower score on the health analogue scale.

Of all the care practices studied, the diversity-related feeding practices were the practices most strongly and consistently associated with better child nutritional status and health, and a lower likelihood of having had diarrhea in the previous two weeks. A few feeding practices, namely continued breastfeeding for children 18-23 months, and being helped to eat for children 24-35 months were negatively associated with HAZ and WAZ. Also, aversive responses to food refusal (threatening, forcing children to eat, etc.) were strongly and negatively associated with WHZ. As discussed above, these negative associations could reflect reverse causality, where the positive caregiver behaviors documented in the survey were responses to poor child outcomes, rather than the negative outcome being a result of the positive practices. All of these care practices could represent "compensatory" maternal responses to the needs of smaller or sicker children who could have been perceived to need more care and attention than bigger, more robust children.

11.5 Conclusions

Results of the bivariate analyses confirm the importance of a number of the hypothesized relationships between different levels of resources for care and care practices, as well as between care practices and child outcomes. In particular, the strong link between food insecurity, maternal distress, low diet quality and poor child outcomes provides clear evidence of the urgent need for interventions to alleviate food insecurity in this population. In that respect, the World Vision program can contribute, especially through its food supplements, to increasing food security among households with young children. The World Vision program also has enormous potential to respond to the need for increased access to health care services, especially preventive health services such as childhood immunization and maternal and child vitamin A supplementation, which are

desperately lacking. Last but not least, the newly developed behavior change and communication strategy, which was developed for this program using a series of qualitative and formative research activities, is now fully integrated into the overall intervention package in both program groups. The strategy aims at strengthening several care practices that were identified through our qualitative research as key to improving child nutrition and health in this population. The associations between many of these same care practices and child outcomes in the baseline survey, especially the practices related to increased dietary diversity and consumption of animal source foods, confirm the potential of the BCC strategy to contribute to reducing malnutrition and morbidity in this population.

REFERENCES

- Aarts, C. et al. "How exclusive is exclusive breastfeeding? A comparison of data since birth with current status data." *International Journal of Epidemiology* 29(2000): 1041-6.
- Allen, L.H. 1994. Nutritional influences in linear growth. *European Journal of Clinical Nutrition* 48 (suppl. 1): S75-S89.
- Arimond, M. and M.T.Ruel. 2002. Progress in Developing an Infant and Child Feeding Index: An Example Using the Ethiopia Demographic and Health Survey 2000. Food Consumption and Nutrition Division Discussion Paper #143. International Food Policy Research Institute. Washington, D.C.
- Armar-Klemesu, M., M.T.Ruel, D.Maxwell, C.Levin, and S.Morris. 2000. "Poor maternal schooling is the main constraint to good child care practices in Accra." *Journal of Nutrition*. 130:1597-1607.
- Birch, L. and J. Fisher "Appetite and eating behavior in children." *Pediatr Clin North Am* 42(1995): 931-53.
- Brown, K.H. et al. "Infant feeding practices and their relationship with diarrhea and other diseases in Huascar (Lima), Peru." *Pediatrics* 83(1989): 31-40.
- Brownie, C. , Habicht, J-P. and Cogill, B. (1986). Comparing indicators of health and nutritional status. *American Journal of Epidemiology*, 124 (6): 1031-1044.
- Carmines, E., and R. Zeller. (1979). *Reliability and validity assessments*. Beverly Hills and London: Sage Publications.
- Caulfield, LE, Huffman, SL, Piwoz, EG. (1999). Interventions to improve complementary food intakes of six to twelve month old infants in developing countries. Impact on growth, prevalence of malnutrition and potential contribution to child survival. Linkages Project. Washington, D.C.: Academy for Educational Development.
- Christian, P., West, K.P., Khattry, S.K. et al. Maternal night blindness increases risk of infant mortality in the first 6 months of life in Nepal. *J. Nutr.* 2001; 131: 1510-1512.
- Christian, P., West, K.P., Khattry, S.K. et al. Night blindness during pregnancy and subsequent mortality among women in Nepal: effects of vitamin A and B-carotene supplementation. *Am. J. Epidemiol.* 2000; 152: 542-547

- Cogill, B. 2001. Anthropometric Indicators Measurement Guide. Food and Nutrition Technical Assistance Project. Academy for Educational Development, Washington, D.C.. 2001.
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. 2nd Edition. Hillsdale, NJ: Lawrence Erlbaum Associates, p. 179-213.
- Curtis, V., S. Cairncross, S. and R. Yonli. 2000. Domestic hygiene and diarrhea – pinpointing the problem. *Trop. Med. Int. Health*; 5:22-32.
- Dettwyler, K.A. "Styles of infant feeding: Parental/caretaker control of food consumption in young children." *American Anthropologist* 91(1989): 696-703.
- Dewey, K.G. and K.H. Brown "Update on technical issues concerning complementary feeding of young children in developing countries and implications for intervention programs." *Food and Nutrition Bulletin* 24(2003): 5-28.
- Doan, R, Bisharat, L. (1990). Female autonomy and child nutritional status: the extended-family residential unit in Amman, Jordan. *Social Science and Medicine* **31**(7): 783-789.
- EMMUS-III (Enquête Mortalité Morbidité et Utilisation des Services) 2000. Ministère de la Santé Publique et de la Population (MSPP), Institut Haïtien de l'Enfance, ORC Macro, Calverton, Md, USA, 2001.
- Engle, P.L., P. Menon, and L. Haddad Care and nutrition: concepts and measurement. Occasional Paper 18. Washington, D.C.: International Food Policy Research Institute, 1997.
- Filmer, D, and L. Pritchett. (2001). Estimating wealth effects without expenditure data - or tears: An application to educational enrollment in states of India. *Demography* **38**(1): 115-132.
- Frongillo E. A., Jr (1999) Validation of measures of food insecurity and hunger. *J. Nutr.* 129(suppl.):506S-509S.
- Frongillo E. A., Jr, Rauschenbach B. S., Olson C. M., Kendall A. & Colmenares A. G. (1997) Questionnaire-based measures are valid for the identification of households with hunger and food insecurity. *J. Nutr.* 127(suppl.):699S-705S.
- Frongillo EA, Nanama S. Development and validation of a questionnaire-based tool to measure rural household food insecurity in Burkina Faso. Proceedings of International Scientific Symposium on Measurement and Assessment of Food Deprivation and Undernutrition, 26-28 June 2002. Food and Agriculture Organization of the United Nations, Rome, 2003, pp. 309-310.

- Frongillo EA, Chowdhury N, Ekström EC, Naved RT. Understanding the experience of household food insecurity in rural Bangladesh leads to measure different from that in U.S. *Journal of Nutrition* (in press).
- Foreman, E.K. (1991). *Survey Sampling Principles*. Marcel Dekker, Inc., New York, NY.
- Golden, M.M.N. (1994). Is complete catch-up possible for stunted malnourished children? *European Journal of Clinical Nutrition* 48 (suppl. 1): 58-71.
- Habicht, J.P., Victora, C.G., and Vaughan, J.P. (1999) Evaluation designs for adequacy, plausibility and probability of public health programme performance and impact. *International Journal of Epidemiology* 28: 10-18.
- Habicht, J-P., Yarbrough, C. and Martorell, R. (1979). Anthropometric field methods: Criteria for selection. In: D. G. Jelliffe and E. F. P. Jelliffe (eds.) , *Human Nutrition Vol. II*, Nutrition and Growth, Plenum Publ. Corp., pp. 365-387.
- IFPRI/UNICEF/UDS (2003). Report of the 2001 survey in Savelugu-Nanton district. Draft project report. March 6, 2003.
- Katz J. (1995). Sample-size implications for population-based cluster surveys of nutritional status. *American Journal of Clinical Nutrition* 61,155-160, 1995. Kim, J., Mueller, C. 1978. Factor Analysis. Statistical Methods and Practical Issues. Quantitative Applications in the Social Sciences, Vol. 14. Sage Publications.
- Kim, J., Mueller, C. 1978. Factor Analysis. Statistical Methods and Practical Issues. Quantitative Applications in the Social Sciences, Vol.14. Sage Publications.
- Krebs-Smith,S.M. et al. "The effects of variety in food choices on dietary quality." *Journal of the American Dietetic Association* 87(1987): 897-903.
- Loechl, C., Menon, P., Ruel, M.T. and G. Pelto (2003). Process used to design an integrated health and nutrition program to prevent child malnutrition in rural Haiti. Report submitted to the Food and Nutrition Technical Assistance (FANTA) project. July 15, 2003.
- Lutter, CK, Mora, JO, Habicht, J-P, Rasmussen, KM, Robson, DS, Herrera, MG. (1990). Age-specific responsiveness of weight and length to nutritional supplementation. *American Journal of Clinical Nutrition* 51(3): 359-64.
- Malhotra, A., S. R. Schuler and C. Boender, 2002. Measuring Women's Empowerment as a Variable in International Development. International Center for Research on Women (ICRW) Working Paper. ICRW: Washington, D.C.

- Marquis,G.S. et al. "Recognizing the reversible nature of child-feeding decisions: breastfeeding, weaning, and relactation patterns in a shanty town community of Lima, Peru." *Social Science and Medicine* 47(1998): 645-56.
- Martorell, R. (1995). ed: The effects of improved nutrition in early childhood: The INCAP follow-up study. *Journal of Nutrition* 125 (4S) 1027S-1138S.
- Maxwell,D. et al. Urban livelihoods and food and nutrition security in greater Accra, Ghana. Research Report #112. Washington, D.C.: International Food Policy Research Institute, 2000.
- Menon, P. (2002). Maternal schooling, child care practices and child nutrition in rural Bangladesh: Mediating and modifying influences. Ph.D. Dissertation. Cornell University, Ithaca, NY 14853.
- Menon, P., Ruel, M.T. & Morris, S.S. (2000) Socio-economic differentials in child stunting are consistently larger in urban than in rural areas. *Food Nutr. Bull.* 21: 282-299
- Menon, P. et al. From research to program design: the use of formative research to develop a behavior change communication program to prevent malnutrition in Haiti. Food Consumption and Nutrition Division Discussion Paper. Washington, D.C.: International Food Policy Research Institute, 2003.
- Menon, P., Ruel, M., Pelto, G., François, Y., Metellus, E. and A. Ferrus. A qualitative study of the patterns of infant feeding and care in the Hinche area of Plateau Central, Haiti. Report submitted to the Food and Nutrition Technical Assistance (FANTA) Project, April 8, 2002.
- Ministry of Public Health and Population and Pan American Health Organization/World Health Organization (PAHO/WHO). 1998. Health Situation Analysis. Haiti 1998. Port-au-prince, Haiti.
- PAHO/WHO. Guiding principles for complementary feeding of the breastfed child. Washington, D.C.: Pan American Health Organization/World Health Organization, 2003.
- Pelto, G., E. Levitt, and L. Thairu "Improving feeding practices: current patterns, common constraints, and the design of interventions. WHO Global Consultation on Complementary Feeding." *Food and Nutrition Bulletin* 24(2003): 43-82.
- Piwoz, E.G. et al. "Potential for misclassification of infants' usual feeding practices using 24-hour dietary assessment methods." *Journal of Nutrition* 125(1995): 57-65.
- Popkin, B.M. et al. "Breast-feeding and diarrhea morbidity." *Pediatrics* 86(1990): 874-82.
- Radimer K. L., Olson C. M. & Campbell C. C. (1992) Development of indicators to assess hunger. *J. Nutr.* 120(suppl.):1544S-1548S.

- Radimer K. L., Olson C. M., Greene J. C., Campbell C. C. & Habicht J.-P. (1992) Understanding hunger and developing indicators to assess it in women and children. *J. Nutr. Educ.* 24:36S-45S.
- Rivera, JA, Habicht, J-P. (1996) The recovery of Guatemalan children with mild to moderate wasting: Factors enhancing the impact of supplementary feeding. *American Journal of Public Health* 86; 10; 1430-1434.
- Rivera, JA, Habicht, J-P. (2002). Effect of supplementary feeding on the prevention of mild to moderate wasting in conditions of endemic malnutrition. *Bulletin of the World Health Organization* 80: 926-932.
- Ruel, M. (2001) The natural history of growth failure: importance of intrauterine and postnatal periods. In: *Nutrition and Growth* (Martorell, R. & Haschke, F., eds.), pp. 123-158. Nestlé Nutrition Workshop Series, Pediatric Program, Vol. 47. Nestec Ltd., Vevey/Lippincott Williams & Wilkins, Philadelphia.
- Ruel, M.T. and P. Menon "Child feeding practices are associated with child nutritional status in Latin America: innovative uses of the Demographic and Health Surveys." *Journal of Nutrition* 132(2002): 1180-7.
- Ruel, M.T. et al. *Urban Challenges to Food and Nutrition Security: A Review of Food Security, Health, and Caregiving in the Cities*. Food Consumption and Nutrition Division Discussion Paper No. 51. Washington, D.C.: International Food Policy Research Institute, 1998.
- Ruel, M.T. Operationalizing dietary diversity: a review of measurement issues and research priorities. *J. Nutr.* November 2003.
- Ruel, M.T. and M. Arimond. 2002. "Spot check observations for assessing hygiene practices: review of experience and implications for programs." *Journal of Health, Population and Nutrition*. 20:65-76.
- Ruel, M.T. and M. Arimond. (in press). Measuring selected child care practices: approaches, indicators and implications for programs. International Food Policy Research Institute Food Policy Review. Washington, D.C.
- Schroeder, D., Martorell, R., Rivera, J., Ruel, M.T. and Habicht, J.P. Age differences in the impact of supplementation on growth. *J. Nutr.* 125 (suppl):1060S-1067S, 1995.
- Smith, L.C., U. Ramakrishnan, A. Ndiaye, L. Haddad, and R. Martorell. 2003. *The Importance of Women's Status for Child Nutrition in Developing Countries*. Research Report #131. International Food Policy Research Institute, Washington, DC.

- Stratton, R.J. et al. "Comparison of the traditional paper visual analogue scale questionnaire with an Apple Newton electronic rating system (EARS) in free living subjects feeding ad libitum." *European Journal of Clinical Nutrition* 52(1998): 737-41.
- Studdert, L.J, E. A. Frongillo, Jr., P. Valois. Household Food Insecurity Was Prevalent in Java during Indonesia's Economic Crisis. *J. Nutr.* 2001 131: 2685-2691.
- UNICEF 2003. *The State of the World's Children*. UNICEF, N.Y.
- Victora, C.G. et al. "Infant feeding and deaths due to diarrhea. A case-control study." *Am J Epidemiol* 129(1989): 1032-41.
- World Health Organization (WHO) (1979) *Measurement of nutritional impact* World Health Organization (WHO), Geneva.
- World Health Organization (WHO). *Measurement of nutritional impact*. Geneva: World Health Organization (WHO), 1979.
- World Health Organization (WHO). *Physical status: the use and interpretation of anthropometry*. WHO Technical Report Series, 854. Geneva, Switzerland: 1995.
- World Health Organization (WHO). *Vaccines and Biologicals. WHO vaccine-preventable diseases: monitoring system. 2002 Global summary*. WHO Geneva.)
- Zohoori, N.J., B.M.Popkin, and M.E.Fernandez "Breast-feeding patterns in the Philippines: a prospective analysis." *Journal of Biosocial Sciences* 25(1993): 127-38.

APPENDICES

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Appendix 2.1. Sample size calculations

Sample size calculations

Sample size requirements for the survey were estimated based on the desired detectable difference in the prevalence of undernutrition among the two program groups. The necessary sample sizes to examine differences in prevalence rates are the same as those necessary to examine differences between distributions, and they are larger than those necessary to examine differences in means (Brownie et al. 1986).

Sample sizes were estimated using an equation for estimating sample sizes for differences in proportions (Cohen 1988). This formula is designed for standard statistical comparisons of differences in proportions and uses the arcsine transformation of the square root of the proportions expected at time 1 and time 2 (P_1 and P_2) to estimate the effect size h . This effect size is then used to estimate the sample size (rather than simple differences in proportions).

Specifically,

$$h = \phi_1 - \phi_2,$$

where,

- h = effect size
- $\phi_1 = 2 \arcsin (\text{sqrt } P_1)$, and
- $\phi_2 = 2 \arcsin (\text{sqrt } P_2)$

The sample size needed to detect the effect size h with a specific alpha level and power is defined by:

$$N_r = N_{.10} / 100h^2 \quad (\text{p. 204, Cohen 1988})$$

where,

- N_r = required sample size
- $N_{.10}$ = sample size required for a given alpha and the desired power at $h=0.10$ (value available from Table 6.4.1 in Cohen 1988 for one-tailed alpha of 0.05 and power of 0.80 is $N_{.10}=1237$; for a power of 0.90, the N with the same alpha and effect size is 1713).

Effect size: The effect size (magnitude of improvements in nutritional status between baseline and post-intervention) documented from previous studies of the effect of supplementation on child growth ranges from 0.25 to 0.46 z-scores for WAZ and 0.04 to 0.35 z-scores for HAZ (Caulfield, Huffman and Piwoz 1999). According to their calculations, an improvement of 0.5 z-scores in nutritional status in a population with average z-scores around -1.5 will result in a 50% reduction in the prevalence of

undernutrition (from 31% to 15%). Also, an improvement of +0.35 z-scores of nutritional status in a population with average z-scores around -2.0 will result in a decline in prevalence of undernutrition from 50% to 38% (a decrease of 12 percentage points).

Design effect: Children within a same village are more likely to be similar than children across villages. This clustering (design) effect must be taken into account when calculating sample sizes because it increases the sample size needed when the intervention is randomized at the cluster, rather than the individual level. The design effect is the ratio of the variance for the cluster sample divided by the expected variance of a simple random sample of the same size.

Since the design effect is dependent on the variance between cluster, it will be smaller if the number of clusters is large and the number within each cluster is small (Foreman 1991). For complex nutrition surveys, it has been shown that clusters with 30 children in each cluster lead to design effects for stunting (HAZ %<-2) that range from 0.44 to 2.13 and 1 to 1.62 for underweight (defined as W/A <60%) (Katz 1995).

In this study, the clusters are the Health Agents and information about the design effect at this level were not available at the time of the calculation of sample size requirements. Design effect will be calculated using information from the baseline survey and will then be used to refine our sample size calculations for the final survey.

Sample size calculations were made to detect 4 levels of differences of underweight and stunting between the baseline and second survey, using two levels of power (0.8 and 0.9), three design effect sizes (1, 1.5 and 2) and information from the DHS 2000 report on the prevalence of stunting and underweight among 12-42 months old children from rural areas. These estimates are presented in Appendix 2 along with a discussion of cost issues in sample size considerations.

Final sample size: After reviewing the information provided in Tables 1 and 2 (Appendix 1), a decision was made between World Vision and the IFPRI/Cornell team to use a sample size of **750 children per group, for a total of 1,500 children**. This sample size is appropriate to detect a difference in the prevalence of stunting of at least 7.5 percentage points (required sample size = 734 children/group; table 2, Appendix 1), assuming an average design effect size of 1.5. This sample size will also give us the ability to detect a difference smaller than 7.5 percentage points in underweight (Table 1, Appendix 1) and differences larger than -0.2 in mean z-scores for both WAZ and HAZ. The required sample size is thus a minimum of 75 children per Health Agent (roughly 25 per community in the selected age range: 12-42 months old) at the time of the baseline survey.

Appendix 2.2. Sample size estimates

This section presents the sample size estimates for detecting 4 levels of differences in prevalence of underweight and stunting between the baseline and second survey. The baseline prevalence used in our calculations is the prevalence of underweight and stunting among rural children between 12 and 42 months, as reported in the DHS 2000 report (EMMUS–III 2000).

For our sample size calculations, one-tailed tests are used rather than two-tailed because biologically, the preventive intervention is expected to reduce faltering *and* improve recuperation, while the recuperative intervention is only expected to improve recuperation, and not prevent faltering. Therefore, one would not expect the recuperative intervention to improve children’s nutritional status more than the preventive intervention. If, indeed, a difference in that unexpected direction was found, it would likely be due to operational reasons, rather than biological. As outlined in the Operations Research sections, we will be collecting information on the operations of both types of interventions. This information will be used to explain why the better expected outcomes were not found. Differentiating between the a finding of a less than expected effect or one that goes in the wrong direction is irrelevant for the purposes of this study. What would be important is that the expectation was not met (the rationale for using the one-tailed test), and why.

In the tables below, sample sizes are presented for 80% and 90% power, as well as for different design effects between 1 and 2. Comparison between groups will be done using a 1-tailed t-test with an expected significance of 0.05.

1) Sample sizes required to detect differences in underweight

Estimated prevalence of underweight among rural children 12-42 months of age \approx 20% (Haiti EMMUS-III 2000).

Range of effect sizes for change in WAZ due to supplementary feeding intervention studies (Caulfield, Huffman and Piweoz 1999) = 0.25-0.46 SD, equivalent to a difference of 5-12% for initial prevalence of 20%

Table 1. Sample sizes required (1-tailed tests) to detect differences in prevalence of underweight for 12-42 months old children

Expected decrease in prevalence of underweight	Power	Design effect	Required sample size per group
(from 20 to 15)=5	0.8	1.0	710
		1.5	1064
		2.0	1410
(from 20 to 15)=5	0.9	1.0	983
		1.5	1474
		2.0	1966
(from 20 to 12.5)=7.5	0.8	1.0	255
		1.5	383
		2.0	510
(from 20 to 12.5)=7.5	0.9	1.0	354
		1.5	531
		2.0	708
(from 20 to 10)=10	0.8	1.0	154
		1.5	232
		2.0	308
(from 20 to 10)=10	0.9	1.0	214
		1.5	321
		2.0	416
(from 20 to 8)=12	0.8	1.0	99
		1.5	149
		2.0	298
(from 20 to 8)=12	0.9	1.0	138
		1.5	206
		2.0	276

2) Sample sizes required to detect differences in stunting

Estimated prevalence of stunting among rural children 12-42 months of age ≈30% (Haiti, EMMUS-III 2000)

Range of effect sizes for change in HAZ due to supplementary feeding intervention studies (Caulfield, Huffman and Piwoz 1999) = 0.04-0.35 SD, equivalent to differences of 5-13% for 30% initial prevalence of stunting.

Table 2. Sample sizes required to detect differences in prevalence of stunting among children 12-42 months old with different levels of power and design effects

Expected decrease in prevalence of stunting	Power	Design effect	Required sample size per group
(from 30 to 25)=5	0.8	1.0	936
		1.5	1404
		2.0	1872
(from 30 to 25)=5	0.9	1.0	1366
		1.5	2048
		2.0	2732
(from 30 to 22.5)=7.5	0.8	1.0	489
		1.5	734
		2.0	978
(from 30 to 22.5)=7.5	0.9	1.0	678
		1.5	1017
		2.0	1356
(from 30 to 20)=10	0.8	1.0	230
		1.5	345
		2.0	460
(from 30 to 20)=10	0.9	1.0	318
		1.5	477
		2.0	636
(from 30 to 17)=13	0.8	1.0	154
		1.5	232
		2.0	308
(from 30 to 17)=13	0.9	1.0	214
		1.5	321
		2.0	428

It is evident from this table and the previous one that measuring an age range where one could expect less than a 5% difference in prevalence between groups or between one time point and the other (i.e., above 42 months) will be prohibitively expensive.

The final decision regarding the exact number of communities and children within communities must be based on the resources available for the fieldwork and also better estimates of the design effects expected in communities in the Central Plateau in Haiti. The cost estimates can be based on the following equation (from Foreman 1991):

$$\text{Total cost of survey, } C=C_0 + M*C_1 + M*N*C_2,$$

where,

C_0 = fixed overhead costs

C_1 = costs of sampling the first stage (here, the communities)

C_2 = costs of sampling the second stage within each first stage (here, children within communities)

M = number of clusters (communities)

N = number of units per cluster (children)

According to Foreman (1991), the final information on costs and the appropriate variances necessary to calculate the actual design effect will ideally come from pilot testing or from a previous survey. We will use the first survey for this purpose.

Appendix 6.1. Variables included in the assets indices.

No.	Type of asset index	Assets included
1.	<ul style="list-style-type: none"> - Durable goods count - Total number of durable goods - Total value of durable goods 	Bucket Little stove Pan Plates Mortar and pestle (large) Cup/mug Bed Mattress Mat Table Chair Small lamp Lamp with glass cover Radio Television Refrigerator Cupboard for plates, etc.
2.	<ul style="list-style-type: none"> - Productive assets count - Total number of productive assets - Total value of productive assets 	Hoe Machete Axe Pick-axe Shovel/Spade Pruning knife Wheelbarrow Plow Granary
3.	<ul style="list-style-type: none"> - Livestock count - Total number of livestock - Tropical livestock unit (TLU) weighted number of livestock 	Mule Horse Beef/cow Pig Goat Chicken/duck

Appendix 6.2. Scoring of variables for the food insecurity scale

No.	Food insecurity-related experience	Variable name	Scoring
1.	Bought a cereal that was less preferred due to lack of money	<i>Q704rec</i>	Yes=1 No=0 Like all cereals=0
2.	Extent of gap between number of meals consumed during the day and ideal number of meals	<i>Mealgapr</i>	No difference=0 Gap of 1 meal=0.5 Gap of 2 or more meals=1
3.	Ate less frequently due to lack of food	<i>Q706rec</i>	Yes=1 No=0
4.	Ate less frequently due to lack of fuel (or money to buy fuel)	<i>Q707rec</i>	Yes=1 No=0
5.	Cooked with less beans than usual	<i>Q710rec</i>	Yes=1 No=0
6.	Cooked with no beans	<i>Q709rec</i>	Yes=1 No=0
7.	Cooking without even adding the head of a herring for flavor	<i>Q711rec</i>	Yes=1 No=0
8.	Cooked same food day after day	<i>Q712rec</i>	Yes=1 No=0
9.	Frequency of going to bed hungry in past 30 days	<i>Q714rec</i>	Never=0 1-7 times=0.5 More than 7 times=1
10.	Children ever went to bed hungry in past 30 days	<i>Q715rec</i>	Yes=1 No=0
11.	Frequency of having worried about not having enough food in past 30 days	<i>Q716rec</i>	Never=0 1-2 times=0.25 At least once a week=0.5 Almost everyday=1
	Total possible score	<i>fdinsec</i>	Maximum possible score=11
	Terciles of food insecurity (based on distribution of <i>fdinsec</i>)	<i>nfdinsec</i>	1=low food insecurity 2=moderate food insecurity 3=severe food insecurity

Appendix 7.1. Scoring of variables for empowerment scales

No.	Measured behavior/attitude	Variable name	Scoring
A.	<i>Couple communication</i> <i>Cronbach's alpha=0.77</i>		
4.	Frequency of communication with spouse about <i>work</i>	<i>Q602a</i>	Never=0 Sometimes=1 Often=2
5.	Frequency of communication with spouse about <i>home</i>	<i>Q602b</i>	Never=0 Sometimes=1 Often=2
6.	Frequency of communication with spouse about <i>expenses</i>	<i>Q602c</i>	Never=0 Sometimes=1 Often=2
7.	Frequency of communication with spouse about <i>community happenings/issues</i>	<i>Q602d</i>	Never=0 Sometimes=1 Often=2
	<i>Total possible score</i>	<i>Q602comm</i>	<i>Minimum=0</i> <i>Maximum=8</i>
B.	<i>Gender identity (agreement/disagreement with statements)</i> <i>Cronbach's alpha=0.23</i>		
1.	Only men should take important decisions	<i>Q603a</i>	Agree=0 Disagree=1
2.	Husband/partner should not let woman work outside home	<i>Q603c</i>	
3.	A woman should accept being beaten to maintain the peace in her home	<i>Q603d</i>	
4.	It is better to send a boy to school than a girl	<i>Q603f</i>	
5.	Husband/partner should help at home if woman works outside home	<i>Q603b</i>	Agree=1 Disagree=0
6.	Woman has right to express her opinion, even if she disagrees	<i>Q603d</i>	
	<i>Total possible score</i>	<i>Q603attd</i>	<i>Minimum=0</i> <i>Maximum=6</i>
C	<i>Ownership of assets</i> <i>Cronbach's alpha=0.58</i>		
1.	Land	<i>Q604a</i>	Possess alone=1 Possess together with someone else=1 Do not possess=0
2.	House respondent lives in	<i>Q604b</i>	
3.	Another house, apartment or room	<i>Q604c</i>	
4.	Animals, like cows, horses, pigs, etc.	<i>Q604d</i>	
	<i>Total possible score</i>	<i>Q604poss</i>	<i>Minimum=0</i> <i>Maximum=4</i>

No.	Measured behavior/attitude	Variable name	Scoring
D	Control over purchases Cronbach's alpha=0.85		
1.	Small amount of foods	<i>Q606a</i>	Yes=1 No=0 Do not buy=Missing
2.	Clothes for herself	<i>Q606c</i>	
3.	Medicines for herself	<i>Q606d</i>	
4.	Toilet articles for herself	<i>Q606e</i>	
5.	Clothes for the children	<i>Q606f</i>	
6.	Medicine for the children	<i>Q606g</i>	
	Total possible score	<i>Q606purc</i>	Minimum=0 Maximum=6
F	Involvement in household decision making Cronbach's alpha=0.81		
1.	Buying important things for the family	<i>Q615a</i>	Respondent involved at all in decision (i.e., if decision is by self or joint)=1 Respondent not involved at all in decision (i.e., decision made by spouse or someone else)=0
2.	What food is prepared everyday	<i>Q615b</i>	
3.	Working to earn money	<i>Q615c</i>	
4.	Visiting relatives & friends	<i>Q615d</i>	
5.	Clinic visits when pregnant	<i>Q615e</i>	
6.	Sending children to school	<i>Q615g</i>	
7.	Care when a child is ill	<i>Q615h</i>	
8.	Raising and disciplining children	<i>Q615i</i>	
9.	Having another child	<i>Q615j</i>	
10.	Breastfeeding and weaning a child	<i>Q615k</i>	
11.	How to feed an infant in the first year of life	<i>Q615l</i>	
	Total possible score	<i>Q615invl</i>	Minimum=0 Maximum=11

Appendix 7.2. Women's mental health scales

Measured symptom	Variable	Scoring
A. Mental stress scale <i>Cronbach's alpha: 0.56</i>		
Poor appetite	Q904a	No=0 Yes=1
Shaking/trembling hands	Q904b	
Being easily excited/irritable	Q904c	
Difficulty in enjoying daily life	Q904d	
Difficulty to do daily work	Q904e	
Getting easily tired	Q904f	
Total possible score	Q904ment	Minimum=0 Maximum=6
B. Frequency of stress symptoms scale <i>Cronbach's alpha: 0.76</i>		
Headaches	Q905a	Never=0 Sometimes=1 Often=2
Get easily frightened	Q905b	
Sleep poorly	Q905c	
Suffer from poor digestion	Q905d	
Have trouble thinking clearly	Q905e	
Feel sad or unhappy	Q905f	
Lose interest in things	Q905g	
Feel tired all the time	Q905h	
Don't want to play with the children	Q905i	
Too tired to play with children	Q905j	
Total possible score	Q905htlh	
C. Time stress scale <i>Cronbach's alpha: 0.80</i>		
Feel there is not enough time to care for house	Q905k	Never=0 Sometimes=1 Often=2
Feel there is not enough time to care for children	Q905l	
Feel there is not enough time to care for self	Q905m	
Feel worried there is not enough time to do daily work	Q905n	
Total possible score	Q905time	Minimum=0 Maximum=8
D. Life satisfaction scale <i>Cronbach's alpha: 0.66</i>		
- are satisfied with the way they live	Q903a	Yes=2 Neither yes or no=1 No=0
- have the important things they wanted in their life	Q903b	
- would change their life over if they could	Q903c	
- are happy with their last child	Q903d	
- like their daily work	Q903e	
- satisfied with husband/partner's help	Q903f	

Measured symptom	Variable	Scoring
- satisfied with help from mother-in-law	<i>Q903g</i>	
- satisfied with help from mother	<i>Q903h</i>	
- satisfied with help received from other family members	<i>Q903i</i>	
- satisfied with help from those outside their family	<i>Q903j</i>	
<i>Total possible</i>	<i>Q903lsat</i>	<i>Minimum=0</i> <i>Maximum=20</i>

Appendix 7.3. Social support and social capital scales

	Measured types of support	Variable	Scoring
A. Financial and material support			
Cronbach's alpha: 0.65			
1.	A place to sleep at night	<i>Q611a</i>	No=0 Yes=1
2.	Someone to borrow money from	<i>Q611b</i>	
3.	Someone who can provide food	<i>Q611c</i>	
	Total possible score	<i>Q611supp</i>	Minimum=0 Maximum=3
B. Help with household chores			
Cronbach's alpha: 0.84			
1.	Cooking	<i>Q218a1</i>	No=0 Yes=1
2.	Laundry	<i>Q218b1</i>	
3.	Fetching water	<i>Q218c1</i>	
4.	Fetching fuel	<i>Q218d1</i>	
5.	Cleaning the house	<i>Q218e1</i>	
6.	Buying groceries	<i>Q218i1</i>	
7.	Caring for youngest child	<i>Q218f1</i>	
8.	Feeding youngest child	<i>Q218g1</i>	
9.	Bathing youngest child	<i>Q218h1</i>	
	Total possible score	<i>ntasks</i>	Minimum=0 Maximum=9
C. Help with child care			
Cronbach's alpha: 0.91			
1.	Caring for youngest child	<i>Q218f1</i>	No=0 Yes=1
2.	Feeding youngest child	<i>Q218g1</i>	
3.	Bathing youngest child	<i>Q218h1</i>	
	Total possible score	<i>chtasks</i>	Minimum=0 Maximum=3
D. Group membership and participation in community groups			
Cronbach's alpha: 0.88			
1.	Participation in discussions related to community	<i>Q612a</i>	Yes=1 No=0
2.	Participation in discussions related to education	<i>Q612b</i>	
3.	Participation in discussions related to health	<i>Q612c</i>	
4.	Participation in discussions related to women's issues	<i>Q612d</i>	
5.	Receive information on health and nutrition	<i>Q612e</i>	
6.	Have benefited from a loan or microcredit program	<i>Q609</i>	
7.	Respondent is a member of a co-operative	<i>Q613</i>	
	Total possible score	<i>Q612scap</i>	Minimum=0 Maximum=7

Appendix 7.4. Scoring of child feeding knowledge scales

	Measured knowledge item	Variable name	Scoring
A. Appropriate age of introduction of new foods			
Cronbach's alpha: 0.63			
1.	Water/other liquids - water - other liquids	Q801a Q801b	<p>For each food group (liquids, semisolids, staples, vegetables, eggs, meats):</p> <p>Introduction of any food in the food group at 6-8 mo=+1 None of foods introduced in the appropriate period of 6-8 mo=0 (i.e., introduction was either too early or too late).</p> <p>Food group variables created: <i>Knowliqd, knowsemi, knowstap, knowveg, knowegg, knowmeat.</i></p> <p>Values for each food group variable were then summed up to create an overall scale.</p>
2.	Semi-solid foods - bread soup - gruels - bean sauce	Q801c Q801d Q801h	
3.	Staple foods - rice - millet - cornmeal	Q801e Q801f Q801g	
4.	Vegetables - vegetables added to the food - vegetables cooked on their own	Q801i Q801j	
5.	Eggs - egg yolk - whole egg	Q801k Q801l	
6.	Meats - chicken - fish - meat	Q801m Q801n Q801o Q801p	
	Total possible score	Intrknow	Minimum=0 Maximum=6
B. Appropriate feeding frequency score			
Cronbach's alpha: 0.51			
1.	No. of meals/day for a 6-8 mo old child	Q803	0 to 1 meal/day = 0 2 and higher =1
2.	No. of snacks/day for a 6-8 mo old child	Q804	0 snacks/day = 0 1 and higher =1
3.	No. of meals/day for a 9-11 mo old child	Q805	0 to 2 meals/day = 0 3 and higher =1
4.	No. of snacks/day for a 9-11 mo old child	Q806	0 snacks/day = 0 1 and higher =1
5.	No. of meals/day for a 12-24 mo old child	Q807	0 to 2 meals/day = 0 3 and higher =1
6.	No. of snacks/day for a 12-24 mo old child	Q808	0 snacks/day = 0 1 and higher =1
	Total possible score	apprfreq	Minimum=0 Maximum=6

	Measured knowledge item	Variable name	Scoring
B. Overall feeding knowledge scale, weighted Cronbach's alpha: 0.06			
1.	Knowledge of appropriate introduction of new foods, weighted	<i>Intrkno2</i>	<i>Intrknow/3</i> – brings contribution of the knowledge on appropriate introduction to 2 points in total (range 0 to +2)
2.	Knowledge scale on appropriate feeding frequency, weighted	<i>Apprfrq2</i>	<i>Apprfreq/3</i> – brings contribution of the knowledge on appropriate feeding frequency to 2 points in total (range 0 to +2)
3.	Age until when a child should be breastfed	<i>Q802n</i>	0-5 mo=-2 6 to 11 mo=0 12 to 17 mo=0.5 18 thru 23=1 24 and beyond=2
	Total possible score	<i>Feedknow</i>	<i>Minimum=-2</i> <i>Maximum=+6</i>

Appendix 8.1. Summary of Guiding Principles for Infant and Young Child Feeding

Source: PAHO/WHO, 2003.

1. DURATION OF EXCLUSIVE BREASTFEEDING AND AGE OF INTRODUCTION OF COMPLEMENTARY FOODS.

Practice exclusive breastfeeding from birth to 6 months of age, and introduce complementary foods at 6 months of age (180 days) while continuing to breastfeed.

2. MAINTENANCE OF BREASTFEEDING. Continue frequent, on-demand breastfeeding until 2 years of age or beyond.

3. RESPONSIVE FEEDING. Practice responsive feeding, applying the principles of psycho-social care.

Specifically: a) feed infants directly and assist older children when they feed themselves, being sensitive to their hunger and satiety cues; b) feed slowly and patiently, and encourage children to eat, but do not force them; c) if children refuse many foods, experiment with different food combinations, tastes, textures and methods of encouragement; e) minimize distractions during meals if the child loses interest easily; f) remember that feeding times are periods of learning and love - talk to children during feeding, with eye to eye contact.

4. SAFE PREPARATION AND STORAGE OF COMPLEMENTARY FOODS. Practice good hygiene and proper food handling by a) washing caregivers' and children's hands before food preparation and eating, b) storing foods safely and serving foods immediately after preparation, c) using clean utensils to prepare and serve food, d) using clean cups and bowls when feeding children, and e) avoiding the use of feeding bottles, which are difficult to keep clean.

5. AMOUNT OF COMPLEMENTARY FOOD NEEDED. Start at 6 months of age with small amounts of food and increase the quantity as the child gets older, while maintaining frequent breastfeeding. The energy needs from complementary foods for infants with "average" breast milk intake in developing countries are approximately 200 kcal per day at 6-8 months of age, 300 kcal per day at 9-11 months of age, and 550 kcal per day at 12-23 months of age. In industrialized countries these estimates differ somewhat (130, 310 and 580 kcal/d at 6-8, 9-11 and 12-23 months, respectively) because of differences in average breast milk intake.

6. FOOD CONSISTENCY. Gradually increase food consistency and variety as the infant gets older, adapting to the infant's requirements and abilities. Infants can eat pureed, mashed and semi-solid foods beginning at six months. By 8 months most infants can also eat "finger foods" (snacks that can be eaten by children alone). By 12 months, most children can eat the same types of foods as consumed by the rest of the family (keeping in mind the need for nutrient-dense foods, as explained in #8 below). Avoid foods that may cause choking (i.e., items that have a shape and/or consistency that may cause them to become lodged in the trachea, such as nuts, grapes, raw carrots).

7. MEAL FREQUENCY AND ENERGY DENSITY. Increase the number of times that the child is fed complementary foods as he/she gets older. The appropriate number of feedings depends on the energy density of the local foods and the usual amounts consumed at each feeding. For the average healthy breastfed infant, meals of complementary foods should be provided 2-3 times per day at 6-8 months of age and 3-4 times per day at 9-11 and 12-23 months of age, with additional nutritious snacks (such as a piece of fruit or bread or chapatti with nut paste) offered 1-2 times per day, as desired. Snacks are defined as foods eaten between meals-usually self-fed, convenient and easy to prepare. If energy density or amount of food per meal is low, or the child is no longer breastfed, more frequent meals may be required.

8. NUTRIENT CONTENT OF COMPLEMENTARY FOODS. Feed a variety of foods to ensure that nutrient needs are met. Meat, poultry, fish or eggs should be eaten daily, or as often as possible. Vegetarian diets cannot meet nutrient needs at this age unless nutrient supplements or fortified products are used (see #9 below). Vitamin A-rich fruits and vegetables should be eaten daily. Provide diets with adequate fat content. Avoid giving drinks with low nutrient value, such as tea, coffee and sugary drinks such as soda. Limit the amount of juice offered so as to avoid displacing more nutrient-rich foods.

9. USE OF VITAMIN-MINERAL SUPPLEMENTS OR FORTIFIED PRODUCTS FOR INFANT AND MOTHER. Use fortified complementary foods or vitamin-mineral supplements for the infant, as needed. In some populations, breastfeeding mothers may also need vitamin-mineral supplements or fortified products, both for their own health and to ensure normal concentrations of certain nutrients (particularly vitamins) in their breast milk. [Such products may also be beneficial for pre-pregnant and pregnant women].

10. FEEDING DURING AND AFTER ILLNESS. Increase fluid intake during illness, including more frequent breastfeeding, and encourage the child to eat soft, varied, appetizing, favorite foods. After illness, give food more often than usual and encourage the child to eat more.

Appendix 8.2. Scoring table for the creation of the food group diversity index.

No.	Foods/food groups included in each group	Variables	Food group variables and coding
Food group diversity index: Cronbach's alpha=0.54			
1.	<ul style="list-style-type: none"> o Cereals such as millet, maize, wheat (without beans) o Cereals with beans o Bread soup, salt cracker gruel, wheat flour gruel (without milk) 	<i>Q325a, Q325b, Q325d, Q325e</i>	<i>Cereals:</i> Yes for any of the variables=1 No for all=0
2.	<ul style="list-style-type: none"> o Bean sauce (without cereals) o Cereals with beans 	<i>Q325c, Q325b</i>	<i>Legumes:</i> Yes for any of the variables=1 No for all=0
3.	<ul style="list-style-type: none"> o Plantain gruel o Other starchy vegetables: (potatoes, yam, manioc, cassava, plantain) 	<i>Q325f, Q325k</i>	<i>Roots/tubers:</i> Yes for any of the variables=1 No for all=0
4.	<ul style="list-style-type: none"> o Pumpkin, orange yam, orange/red-flesh sweet potato, carrots o Green leafy vegetables o Papaya or mango 	<i>Q325g, Q325h, Q325i</i>	<i>Vitamin A-rich fruits and vegetables:</i> Yes for any of the variables=1 No for all=0
5.	<ul style="list-style-type: none"> o Other fruits such as oranges, banana, grapefruits o Other vegetables such as avocados, tomatoes, peas - 	<i>Q325j, Q325l</i>	<i>Other fruits and vegetables:</i> Yes for any of the variables=1 No for all=0
6.	<ul style="list-style-type: none"> o Chicken and other birds (pintade, duck, pigeon) o Fish (dried herring) o Sea food (crab, etc.) o Eggs 	<i>Q325m, Q325n, Q325o, Q325p, Q325q, Q325r</i>	<i>Meat/poultry/egg/fish:</i> Yes for any of the variables=1 No for all=0
7.	<ul style="list-style-type: none"> o Peanuts, groundnuts, other nuts 	<i>Q325s</i>	<i>Nuts:</i> Yes for any of the variables=1 No for all=0
8.	<ul style="list-style-type: none"> o Milk, breast milk substitute 	<i>Q324b, q324c</i>	<i>Dairy:</i> Yes for any of the variables=1 No for all=0
	TOTAL SCORE (<i>dietdiv8</i>)		Minimum=0 Maximum=8

Appendix 9.1. Scoring of variables for child, respondent and house cleanliness scales

No.	Measured behavior/attitude	Variable name	Scoring
A. Child cleanliness <i>Cronbach's alpha=0.91 (for naked children); 0.92 (for clothed children)</i>			
8.	State of the child's hands	Q504a/q505a	Dirty=1 Dusty=2 Clean=3
9.	State of the child's hair	Q504b/q505b	
10.	State of the child's body (or clothes for children who were clothed)	Q504c/q505c	
11.	State of the child's face	Q504d/q505d	
12.	Did the child have a runny nose that hadn't been cleaned?	Q506	Yes=0 No=1
	Total possible score	chclean	Minimum=4 Maximum=13
B. Respondent cleanliness <i>Cronbach's alpha=0.83</i>			
1.	State of the mother's hands	Q502a	Dirty=1 Dusty=2 Clean=3
2.	State of the mother's hair	Q502b	
3.	State of the mother's clothes	Q502c	
4.	State of the mother's body/clothes	Q502d	
	Total possible score	motclean	Minimum=4 Maximum=12
C. House interior cleanliness <i>Cronbach's alpha=0.86</i>			
7.	Does the interior of the house look like it needs to be swept?	Q515	Yes=0 No=1
8.	Is the drinking water container covered?	Q516	Yes=1 No=0
9.	Can piles of dirty clothes be observed inside the house?	Q517	Yes=0 No=1
	Total possible score	Intclean	Minimum=0 Maximum=3
C. House exterior (compound) cleanliness <i>Cronbach's alpha=0.62</i>			
5.	Does the area around the house look like it needs to be swept?	Q510	Yes=0 No=1
6.	Can human feces be observed around the house?	Q511	Yes=0 No=1
7.	Can animal droppings be observed around the house?	Q512	Yes=0 No=1
8.	Can garbage be observed around the house?	Q513	Yes=0 No=1
	Total possible score	extclean	Minimum=0 Maximum=4

Reference List

- Aarts,C. et al. "How exclusive is exclusive breastfeeding? A comparison of data since birth with current status data." *International Journal of Epidemiology* 29(2000): 1041-6.
- Arimond,M. and M.T.Ruel *Progress in Developing an Infant and Child Feeding Index: An Example Using the Ethiopia Demographic and Health Survey 2000. Food Consumption and Nutrition Division Discussion Paper #143*. Washington, D.C.: International Food Policy Research Institute, 2002.
- Birch,L. and J.Fisher "Appetite and eating behavior in children." *Pediatr Clin North Am* 42(1995): 931-53.
- Brown,K.H. et al. "Infant feeding practices and their relationship with diarrhea and other diseases in Huascar (Lima), Peru." *Pediatrics* 83(1989): 31-40.
- Dettwyler,K.A. "Styles of infant feeding: Parental/caretaker control of food consumption in young children." *American Anthropologist* 91(1989): 696-703.
- Dewey,K.G. and K.H.Brown "Update on technical issues concerning complementary feeding of young children in developing countries and implications for intervention programs." *Food and Nutrition Bulletin* 24(2003): 5-28.
- Engle,P.L., P.Menon, and L.Haddad *Care and nutrition: concepts and measurement. Occasional Paper 18*. Washington, D.C.: International Food Policy Research Institute, 1997.
- Krebs-Smith,S.M. et al. "The effects of variety in food choices on dietary quality." *Journal of the American Dietetic Association* 87(1987): 897-903.
- Marquis,G.S. et al. "Recognizing the reversible nature of child-feeding decisions: breastfeeding, weaning, and relactation patterns in a shanty town community of Lima, Peru." *Social Science and Medicine* 47(1998): 645-56.
- Menon,P. et al. *From research to program design: the use of formative research to develop a behavior change communication program to prevent malnutrition in Haiti. Food Consumption and Nutrition Division Discussion Paper*. Washington, D.C.: International Food Policy Research Institute, 2003.
- PAHO/WHO *Guiding principles for complementary feeding of the breastfed child*. Washington, D.C.: Pan American Health Organization/World Health Organization, 2003.

- Pelto,G., E.Levitt, and L.Thairu "Improving feeding practices: current patterns, common constraints, and the design of interventions. WHO Global Consultation on Complementary Feeding." *Food and Nutrition Bulletin* 24(2003): 43-82.
- Piwoz,E.G. et al. "Potential for misclassification of infants' usual feeding practices using 24-hour dietary assessment methods." *Journal of Nutrition* 125(1995): 57-65.
- Popkin,B.M. et al. "Breast-feeding and diarrhea morbidity." *Pediatrics* 86(1990): 874-82.
- Ruel,M.T. et al. *Urban Challenges to Food and Nutrition Security: A Review of Food Security, Health, and Caregiving in the Cities. Food Consumption and Nutrition Division Discussion Paper No. 51.* Washington, D.C.: International Food Policy Research Institute, 1998.
- Ruel,M.T. and P.Menon "Child feeding practices are associated with child nutritional status in Latin America: innovative uses of the Demographic and Health Surveys." *Journal of Nutrition* 132(2002): 1180-7.
- Ruel,M. "The natural history of growth failure: importance of intrauterine and postnatal periods." *Nutrition and Growth.* R.Martorell and F.Haschke, eds., 123-58. Philadelphia: Nestlé Nutrition Workshop Series, Pediatric Program, Vol. 47. Nestec Ltd., Vevey/Lippincott Williams & Wilkins, 2001.
- Victora,C.G. et al. "Infant feeding and deaths due to diarrhea. A case-control study." *Am J Epidemiol* 129(1989): 1032-41.
- WHO *Physical status: the use and interpretation of anthropometry. WHO Technical Report Series, 854.* Geneva, Switzerland: 1995.
- Zohoori,NJ., B.M.Popkin, and M.E.Fernandez "Breast-feeding patterns in the Philippines: a prospective analysis." *Journal of Biosocial Sciences* 25(1993): 127-38.