Strengthening and Evaluating the "Preventing Malnutrition in Children Under Two Years of Age Approach" (PM2A) in Guatemala

Cross-Sectional Baseline Report

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ACRONYMS

AED	Academy for Educational Development
AIEPI	Integrated Care of Prevalent Childhood Illnesses
AINM-C	Integrated Health Care for Women and Children in Communities
BCC	Behavior change communication
BCG	Bacillus Calmette-Guérin
BMI	Body Mass Index
CC	Convergence Center
CSB	Corn-Soy Blend
DHS	Demographic and Health Survey
EBS	*Equipo Básico de Salud*
ENSMI	*Encuesta Nacional de Salud Materno Infantil*
FANTA-2	Food and Nutrition Technical Assistance II Project
FFP	Food for Peace
GMP	Growth Monitoring and Promotion
HAZ	Height-for-Age Z-score
HDDS	Household Dietary Diversity Scale
HH	Household
HHS	Household Hunger Scale
IFPRI	International Food Policy Research Institute
IMCI	Integrated Management of Childhood Illness
IPTT	Indicator Performance Tracking Table
IYCF	Infant and Young Child Feeding
LNS	Lipid-based Nutrient Supplement
MC	Mercy Corps
MMR	Measles, Mumps, and Rubella
MNP	Micronutrient Powder
MSPAS	*Ministerio de Salud Pública y Asistencia Social*
MUAC	Mid-Upper Arm Circumference
MYAP	Multi Year Assistance Program
NGO	Non-Governmental Organization

ORS	Oral rehydration salts
PDA	Personal Digital Assistant
PEC	*Programa de Extensión de Cobertura*
PM2A	Preventing Malnutrition in Children under Two Years of Age Approach
PPS	Probability Proportional to Size
PROCOMIDA	*Programa Comunitario Materno Infantil de Diversificación Alimentaria*
SBS	*Servicios Básicos de Salud*
SD	Standard Deviation
SIAS	*Sistema Integral de Atención en Salud*
USAID	United States Agency for International Development
WAZ	Weight-for-Age Z-score
WHO	World Health Organization
WHZ	Weight-for-Height Z-score

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Executive summary

This report summarizes the findings of the baseline survey carried out in Alta Verapaz in May 2010 as part of the cross-sectional impact evaluation component. The cross-sectional evaluation was designed to comply with Food for Peace (FFP) requirements for all organizations implementing USAID-funded MYAPs. The overall aim of this evaluation component is to assess the program's impact on infant and young child feeding (IYCF) practices and on child nutritional status.[1] The specific objectives were to estimate (1) the change in the population-level prevalence of undernutrition (stunting, underweight, and wasting) among children from 6 to 59 months of age, and (2) the change in population prevalence of optimal IYCF practices among infants and young children from birth to 23 months of age.

Data were collected in 45 randomly selected clusters (defined a CC with all of the communities it serves). Questionnaires developed and pre-tested with input from relevant healthcare practitioners and field staff in Guatemala were used to collect data at the CC, community, and household level. Households were drawn from a census list of all nuclear households with children less than 60 months of age.

Summary of Key Findings

Convergence centers and community healthcare infrastructure

Even though CCs and communities appear to have an adequate level of healthcare personnel, their ability to supply quality healthcare services is limited due to a lack of necessary medical equipment and supplies and the limited knowledge of the health staff. All of the surveyed CCs had a scale to monitor child weight, but few had length/height boards to monitor height. Furthermore, most CCs did not have the ten essential medications. Health staff demonstrated an acceptable level of knowledge on topics related to breastfeeding and the introduction of complementary foods. However, basic hygiene knowledge was lacking and while they knew more danger signs than mothers did, they still could only mention two danger signs for sick children and three for pregnant women.

Household characteristics

The families surveyed live in small houses of poor quality without access to basic services such as water and electricity. Surprisingly, no household reported that they had experienced severe hunger and only few had experienced moderate hunger. The quality of the household diet, however, was poor. Households predominantly consumed staple cereals, oils, and sugar, with some beans and eggs. Less than half of households consumed meat. The consumption of fruits, dairy, vegetables, or fish was rare.

Characteristics and knowledge of mothers

Mothers were of Mayan ethnicity. Two-thirds were illiterate and did not speak Spanish. Knowledge of correct breastfeeding practices was high, but only half of mothers could identify the correct age for the introduction of complementary foods. As discussed below, the caregivers' knowledge did not correspond to actual practices. Few mothers knew the danger signs of pregnancy or the danger signs of childhood illness.

[1] The program's *Indicator* Performance Tracking Table (IPTT) is presented in **Appendix A**.

Preventive healthcare seeking

Most women attended a sufficient number of prenatal visits, and the majority of them received the expected services (e.g., tetanus shots and blood pressure measurement). While most CCs did not have the necessary equipment to provide the required prenatal services (see Table 3.1), these medical supplies are supposedly brought by the nurse or doctor at their monthly CC visits or are owned by the midwife. The survey did not verify whether this was the case, however. Notwithstanding the popularity of prenatal care, two-thirds of women delivered at home (65%). Close to 90 percent of all deliveries, however, were attended by a trained health professional, which probably explains the high proportion of newborns having received essential newborn care. Postnatal care appears to be inadequate as less than a quarter of newborns were attended by a doctor or a nurse and less than 20 percent saw a CC-approved midwife.

Attending growth monitoring and promotion in children 12 to 23 months was near universal. On average, children attended a little over half the number of the visits recommended by the MSPAS. Although the majority of children attended at least some of their recommended preventive health visits, many children were not fully immunized nor received all of the recommended micronutrient supplements. Less than half of children had received a mega-dose of vitamin A in the past six months and only about half received iron and folic acid or *Chispitas*. Another potential problem is that some children received both *Chispitas* and iron and folic acid supplements. It is unclear if these were distributed simultaneously to these children or at different time points. Use of different supplements in the same household could lead to confusion and possible improper use, and, if given at the same time, for a prolonged period of time, could lead to problems of toxicity, especially in terms of iron use. About one-third of children 18 to 23 months of age were not fully immunized. Our results further indicate that vaccinations were often received later than recommended, potentially reducing their effectiveness in preventing disease.

Infant and young child feeding practices

Breastfeeding is universal in this population, but early introduction of liquids and foods is a concern. Early introduction of liquids puts children at increased risk of food- and water-borne infections and may displace breast milk, thereby reducing nutrient intake from breast milk. Widespread use of bottle feeding also puts children at further risk of disease, as proper hygiene or sterilization is likely to be unavailable.

On the knowledge test, approximately one-half of the mothers reported correctly that children should start receiving liquids and semi-solid foods at 6 months. When asked about their practices, however, many mothers reported introducing foods and liquids other than breast milk much earlier than 6 months. Early introduction of inappropriate foods along with poor food hygiene, poor water quality and sanitation can lead to poor nutritional status and morbidity, the combination of which likely contributes to the high rates of stunting and diarrhea in this population. On the other hand, over 10 percent of children had not been given complementary foods until after 6 months of age, which can have negative implications for nutrient intake, since breast milk is no longer sufficient from 6 months onward.

Frequency of feeding was also inadequate in many children, and this became worse as children grew older and the recommended number of feedings increases. Dietary diversity and the consumption of iron-rich foods, however, improved with age, probably as children gradually

move toward consuming the family diet. Overall, however, only 60 percent of our sample of children under 2 years of age consumed four or more food groups and 52 percent consumed iron-rich (or iron-fortified) foods in the previous 24 hours.

In summary, while breastfeeding is nearly universal and continued well into the second year of the child's life, exclusive breastfeeding for the first 6 months and the low quality and frequency of complementary feeding constitute a major problem.

Anthropometry of the mother

The high average BMI (24.8) and the high prevalence of overweight and obesity (40%) among mothers are alarming. This finding is consistent with the low prevalence of hunger and the poor quality diet lacking diversity. The high prevalence of overweight and obesity in this population is of particular concern in the context of the PROCOMIDA program, which provides households with family food rations including oil, rice, and beans. The high prevalence of overweight and obesity was unknown to the program when the BCC was designed. PROCOMIDA may thus have to consider adding a BCC module on healthy eating, dietary diversity, balanced diets, and how to prevent overweight and obesity.

Child nutrition and health status

Almost half of children had been ill in the preceding two weeks according to mother reports, mainly with fever, lack of appetite, cough, and diarrhea. Only half of the children with diarrhea were treated with ORS. Of the 30 percent of children who had a potentially severe illness in the previous two weeks, less than one-third received medical attention as is recommended. The high levels of morbidity and the inadequate care-seeking behaviors are in line with the poor housing and sanitation condition of most households, the limited knowledge of caregivers regarding the prevention of illness, the identification of danger signs, and the appropriate feeding of children during illnesses.

As documented previously in Guatemala, stunting was found to be a major problem. Child growth followed the pattern seen in most developing countries: growth faltering starts in the first few months of life (even in populations where birth weight is largely normal) and intensifies gradually throughout the first two years to reach a plateau at the ages of two to three years (Ruel 2001; Victora et al. 2010). As has been observed in other countries, the prevalence of stunting was significantly higher in boys than in girls. This is thought to be due to boys being biologically weaker and thus more prone to suffering from the negative impact of adverse environments than girls (Wamani et.al 2007).

There was no wasting in this population and the prevalence of underweight was at moderate levels, with the majority of underweight likely to be explained by the high levels of stunting, whereby a short child would likely weigh less for his age than expected.

The overall picture of child growth (high levels of child stunting and the absence of wasting) is in line with the other findings of this study. Household hunger was found to be uncommon, indicating that household dietary energy deficiency does not constitute a major problem. The quality of the household and child diet, however, was found to be low. As a consequence, children may lack some essential micronutrients, which result in growth faltering. Maternal short stature (39% < 145 cm) is also likely to be associated with growth retardation *in utero.* Another

important factor that most likely contributes to the children's short stature are repeated bouts of illness.

Differences between strata

While some differences were found between the strata, it was well within the bounds that would be expected with multiple comparisons. Furthermore, there were no systematically consistent differences between the strata, indicating that the strata were comparable.

Recommendations

Based on the findings of the baseline study, we provide the following recommendations to improve the health and nutrition of the population targeted by PROCOMIDA in Guatemala. Some of these recommendations fall within the scope of activities PROCOMIDA proposed to do as part of the implementation of the PM2A program. Others, however, are beyond the scope of what can be addressed by the program.

Health system

Strengthening the provision and quality of healthcare requires a better supply of basic medical equipment, supplies, and medicine. The basic health knowledge of the staff needs to be improved through retraining of current staff and better pre-service training of new personnel. One area of training should be the correct type of timing of micronutrient supplements. In the research arms implementing LNS and MNPs health staff will receive training on the correct use of these supplements. Staff should also be trained on adult education didactics to ensure that knowledge is effectively transferred to the beneficiary population.

Our findings indicate that care-seeking for postnatal care, for preventive child healthcare (including immunizations), and for (severe) childhood illness was deficient. Our data do not allow us to determine to what extent characteristics of the health sector are responsible for this limited demand. Ensuring a reliable supply of medicines and vaccines and removing language and cultural barriers between the Q'eqchi'-speaking population and Spanish-speaking health professionals should lead to a more adequate utilization of health services.

Household diet

The high prevalence of overweight and obesity among women (combined with the absence of wasting in children) in the Alta Verapaz region indicates that household dietary energy deficiency does not constitute a problem. The low prevalence of hunger provides further evidence in this direction. If not properly used, the foods provided by the PROCOMIDA program will contribute to a further rise in unhealthy weights. To prevent this from happening, the PROCOMIDA BCC campaign should actively promote the adequate use of the family ration. Beneficiary households should consider the family ration as a means to relieve household budget constraints (freeing up resources that can be used to buy high quality, nutrient-dense diets) rather than a supply of additional calories that will be simply added to the household diet.

Mother health and IYCF practices

Our results confirm that a major emphasis of the PROCOMIDA BCC strategy should be not only on improving the caregivers' knowledge of health and child-feeding practices, but more importantly on promoting the adoption of recommended practices. Messages promoting better

practices also need to be accompanied by support to caregivers and their families to facilitate putting the improved knowledge into practice.

In addition to improving caregiver knowledge, better household dietary diversity could contribute to better quality diets for children as well. As indicated above, households should be encouraged to use the family ration as a supply of additional resources, allowing them to improve the quality of the household diet. In addition to the beneficial effect on child dietary intake, this would also contribute to better nutritional status of other household members.

1. Introduction

This report describes the findings from the baseline survey carried out in Alta Verapaz, Guatemala, in the context of the impact evaluation of the "Preventing Malnutrition in Children Under Two Years of Age Approach" (PM2A) program (*Programa Communitario Materno Infantil de Diversificación Alimentaria* [PROCOMIDA]). PROCOMIDA is a United States Agency for International Development (USAID) Multi Year Assistance Program (MYAP) funded out of the Public Law 480 Title II resources and implemented by Mercy Corps (MC). The overall goals of the program are to improve the health and nutritional status of pregnant and lactating women and children under two years of age and to strengthen the quality and delivery of healthcare services. PROCOMIDA's activities focus on three interrelated components: the distribution of family and individual food rations; the required participation of beneficiaries in a behavior change communication strategy focused on improving health and nutrition-related behaviors; and the required use of preventive health services for pregnant and lactating women and children less than 2 years of age.

The Guatemala PROCOMIDA program also incorporates a research program being undertaken by the International Food Policy Research Institute (IFPRI) in collaboration with MC, and with funding from the USAID through the Food and Nutrition Technical Assistance II (FANTA-2) project of AED. FANTA-2 also provides technical input and oversight for the implementation and evaluation of the PROCOMIDA program. The overall objectives of the research are to assess the impact and cost-effectiveness of PROCOMIDA on child nutritional status; and to assess the differential and absolute impact of varying the food ration composition and size in a PM2A program such as PROCOMIDA.

In order to assess the program impact, two complementary study designs are being used: a cross-sectional study, which is described here; and a longitudinal study. The longitudinal study will use a cluster randomized cohort (i.e., longitudinal) design, whereby mothers will be followed during pregnancy and their child will be followed from birth until 24 months of age. This study will be launched in early 2011.

This report summarizes the findings of the baseline survey carried out in Alta Verapaz in May 2010 as part of the cross-sectional impact evaluation component. The post-intervention survey will be carried out exactly four years later, in May 2014. The cross-sectional evaluation was designed to comply with Food for Peace (FFP) requirements for all organizations implementing USAID-funded MYAPs. The overall aim of this evaluation component is to assess the program's impact on infant and young child feeding (IYCF) practices and on child nutritional status.[2] The specific objectives are to estimate (1) the change in the population-level prevalence of undernutrition (stunting, underweight, and wasting) among children from 6 to 59 months of age, and (2) the change in population prevalence of optimal IYCF practices among infants and young children from birth to 23 months of age.

The report is organized as follows: Section 2 describes the methods used for the cross-sectional component of the impact evaluation of PROCOMIDA; Section 3 provides the key descriptive results of the baseline survey at the convergence center (CC), community, household and

[2] The program's Indicator Performance Tracking Table (IPTT) is presented in **Appendix A**.

individual level; and Section 4 presents a summary of findings, and the implications of these findings for PROCOMIDA.

2. Methods

2.1 Study Setting

PROCOMIDA is being implemented by MC in the department of Alta Verapaz in Guatemala. The majority ethnic group in the PROCOMIDA area is Q'eqchi'. Communities are predominately rural; however, a few of the communities are located near urban centers. Households dedicate themselves to agricultural activities, such as growing corn, beans, coffee, and cardamom.

Alta Verapaz is one of the most food-insecure areas of Guatemala and has some of the highest rates of stunting and infant and maternal mortality in the country (World Food Programme 2009; ENSMI 2009). MC chose to work in four of the sixteen Alta Verapaz municipalities (Cahabón, Cobán, Lanquín, and San Pedro Carchá). The CCs within these municipalities were chosen based on year-round access by road as well as other logistical considerations.

PROCOMIDA is implemented through CCs, which are health centers located in rural *aldeas* (small rural villages) that do not have any other health clinic. The main task of the CC is to carry out the "Integrated Care of Prevalent Childhood Illnesses and Integrated Health Care for Women and Children at the Community Level" (AIEPI-AINM-C) program, Guatemala's integrated healthcare strategy. The AIEPI-AINM-C provides integrated case management of childhood illness, monthly growth monitoring and promotion (GMP) for children, standard care for pregnant and lactating women, and the provision of vaccinations and micronutrient supplements for pregnant and lactating women and children less than 5 years of age.

The AIEPI-AINM-C is implemented through the Extension of Coverage Program (PEC, Programa de Extensión de Cobertura). The PEC is funded by the Integrated System for Health Care (*Extension de Cobertura-Sistema Integral de Atención en Salud* [SIAS]) and was introduced in Guatemala in 1997 as part of the 1996 Peace Accords. SIAS is managed by the Ministry of Public Health and Social Assistance (*Ministerio de Salud Pública y Asistencia Social* [MSPAS]). The system aims to expand health coverage to the largely rural population and to improve the quality of these services by providing basic health services (*Servicios Básicos de Salud* [SBS]) to pregnant and lactating women and children less than 5 years of age through contracts with local non-governmental organizations (NGOs). The PEC system reaches areas that are not covered by regular Ministry of Health services in Guatemala and covers approximately 60-70 percent of the population in Guatemala. Services are provided monthly at the local CC by the *Equipo Básico de Salud* (EBS), which includes a doctor or a nurse (*medico o enfermera ambulante*), an institutional facilitator (*facilitador institucional*), a CC-approved midwife (*comadrona capcitada*), a community facilitator (*facilitador comunitario*), and community health workers (*vigilantes de salud*) (Maupin 2009). The doctor or nurse and the institutional facilitator attend the CC once a month. The other members of the EBS staff are based in the communities serviced by each CC.

2.2 PROCOMIDA Evaluation Design

For the purposes of the IFPRI-led research on PROCOMIDA, and more specifically to answer questions related to optimal size and composition of food rations for PM2A programs, the team identified five treatment groups and a control group (see **Appendix B** for food ration sizes). The study arms are as follows:

- Group A: Family ration + individual ration of fortified Corn-Soy Blend (CSB)
- Group B: Reduced family ration + individual ration of CSB
- Group C: No family ration + individual ration of CSB
- Group D: Family ration + individual ration of Lipid-based Nutrient Supplement (LNS)
- Group E: Family ration + individual ration of Micronutrient Powder (MNP) supplement
- Group F: No PROCOMIDA intervention, but access to the standard MSPAS health services (control group)

Thus, beneficiaries in all five treatment arms (A-E) receive some type of ration that varies in type and amount between groups. In order to receive their ration, beneficiaries are required to participate in behavior change communication (BCC) activities and to comply with regular visits to health centers to seek preventive health and nutrition services. In these treatment groups, the individual ration is targeted to the beneficiary (a pregnant or lactating woman or a child aged 6-23 months of age). The family ration is distributed to the beneficiary (or the primary caregiver of the beneficiary in the case of children 6-23 months) to be consumed by the household. A woman can enroll in the program during pregnancy and will continue to receive the individual ration until her child is 6 months of age (the recommended timing for transitioning from exclusive breastfeeding to the introduction of complementary foods to the infant). After that, the child receives the individual ration until s/he reaches 24 months of age. The family ration is distributed throughout this time period (i.e., from pregnancy until the child reaches 24 months of age), except in the case of group C (no family ration). The household stops receiving program benefits once the child is 24 months of age, unless there is a newly pregnant or lactating women or another child 6 to 23 months of age in the household.[3] In the control group area (Group F), households have access to the standard MSPAS health services, but there is no food/fortified product distribution or BCC activities taking place. More details on the study design and research arms can be found in the Research Proposal (Leroy, Olney, and Ruel 2009).

PROCOMIDA is implemented in 221 CCs, of which 120 were randomly selected to be included in one of the research arms of the impact evaluation study. Each of the selected CCs was randomly assigned to one of five treatment arms or the control arm. A sample of households from each of 120 CCs will be followed over time for the longitudinal study. The baseline household sample for the cross-sectional study was drawn from 45 of the 120 CCs selected for the impact evaluation study in 2010; a new household sample will be drawn from the same 45 CCs for the endline in 2014 (see Section 2.3.1).

2.3 Cross-Sectional Study Methods

2.3.1 Sampling and sample size

Sample size was defined for children less than 0-59 months of age, since the overall aim of the evaluation is to assess the change in population-level prevalence of undernutrition in children from 6-59 months of age and the change in IYCF practices in children from 0-23 months of age. This sample size calculation provides a sample that complies with the FFP requirements for all organizations implementing USAID-funded MYAPs.

[3] There are other situations in which the rations might be discontinued, such as the death of the child or migration of the family.

Because of the different interventions in the treatment arms, the size of the impact on the outcomes of interest is expected to vary across the arms. To ensure that the cross-sectional sample captured this heterogeneity, a number of strata were defined from which the CCs and, thus, households were drawn. Two treatment strata were defined: ABC and DE, based on the null hypotheses that there are no differences in child growth between treatment groups A, B, and C (CSB groups) – where only the family ration varies – and between groups D and E – where the individual ration is a fortified product in the form of either a MNP or a LNS (LNS/MNP groups). The third stratum defined was the control group (Group F).[4]

The parameters used for the sample size calculation were a type 1 error of 0.05, power of 0.80, a minimal detectable difference of 10 percentage points between baseline and follow-up in the prevalence of stunting, an intracluster correlation of 0.01, and 15 clusters (CCs) per stratum. These parameters resulted in a sample size for a simple control vs. treatment group comparison of 436 children 0-59 months of age per group. Sample size of the treatment group was then multiplied by two to accommodate the two treatment strata, resulting in 872 children in the treatment group (436 children in each of the two strata) and 436 children 0-59 months of age in the control group. More details on the sample size calculation can be found in the research proposal (Leroy, Olney, and Ruel 2009).

From each of the three strata described above, 15 clusters (CCs) were selected for the cross-sectional study, resulting in a total of 45 study clusters (15 clusters for the ABC stratum, 15 for the DE stratum, and 15 for the control stratum). Clusters were selected using the probability proportional to size (PPS) algorithm described in FANTA-2 guidelines (FANTA-2 Project 2009). The majority of selected CCs were located in the municipality of San Pedro Carchá (23) and Cobán (13), which are the largest of the four municipalities. The sampled CCs served a total of 107 *aldeas* or an average of 2.4 *aldeas* per CC.

Households were drawn from a census list of all nuclear households with children less than 60 months of age. The census was conducted by MC field staff. A nuclear household was defined as the mother, her partner, and children that are cared for by the pair.[5] Virtually all primary caregivers were the biological mother of the child (1,305 out of 1,308 or 99.8%). We decided to pool all children and refer to the primary caregivers as mother throughout the text. Using this household list, 35 households were randomly selected from each cluster and the first 29 households were surveyed (for a total of 1,308 households).[6] The remaining six households in each cluster served as replacement households if a selected household could not be interviewed. Every selected household was visited three times before a replacement was chosen. In the endline survey, a new census of households with children less than 60 months of age will be conducted in the same 45 CCs and a new sample of households drawn.

2.3.2 Data collection

Data were collected at the CC, community, and household level, using questionnaires developed and pre-tested with input from relevant healthcare practitioners and field staff in Guatemala. A

[4] The design of the cross-sectional study does not allow us to compare the study arms. The extent to which the strata are comparable on relevant variables is presented in this report.

[5] Children do not have to be the biological child of the mother or father to be included. Adopted children or those in the care of the family were also included.

[6] In three CCs, 30 households were interviewed.

list of modules included in each of the questionnaires is presented in **Tables 2.1-2.4** along with a brief description of each module.

Convergence center questionnaires—The CC questionnaire focused on health services provided by the CC, infrastructure, and supplies available to and used by healthcare practitioners (**Table 2.1**). A separate questionnaire tested the knowledge of key CC healthcare staff (**Table 2.2**), which focused on practitioner knowledge around services provided by the CC, infant care, breastfeeding practices, and care for pregnant mothers.

Table 2.1 List of modules included in CC questionnaire

Module	Topic	Description	Respondent
1	Interviewees	Information on the individuals present for the CC interview.	Community facilitator
2	Healthcare personnel	Information on the healthcare staff of the CC.	Community facilitator
3	Medical equipment	Information on the availability of supplies at the CC, including medical equipment and education material and excluding medicines and supplements.	Community facilitator
4	Medicine and micronutrient supplements inventory	Information on medicine and micronutrient supplements that should be at the CC. The module was designed to differentiate between medicine and micronutrient supplements that should be in the CC at all times and those that are brought each month by the visiting nurse or doctor.	Community facilitator
5	Administration and infrastructure	Information on the administration of the CC, including such things as how many days the CC is open and how many visits the community facilitator makes each month, etc. Information was also collected on the infrastructure of the CC, such as the type of building, if it has electricity, the type of bathroom, etc.	Community facilitator
6	CC health services	Information on the type of healthcare services offered by the CC.	Community facilitator

Table 2.2 List of modules included in knowledge questionnaire for key CC staff

Module	Topic	Description	Respondent
1	Education and basic knowledge of CC staff	Information on the education level of key CC staff and the training sessions they have attended. Information was also collected on the staff knowledge of AIEPI-AINM-C services children should receive at the CC and which micronutrient supplements children and pregnant and lactating women should take.	Doctor or nurse, community facilitator, CC-approved midwife, and community health worker
2	Danger signs that require immediate medical attention	Interviewees were asked to mention the danger signs that require medical attention for pregnant women, lactating women, and specific age ranges for children under two years of age. Danger signs for pregnancy were only asked of the CC-approved midwife, the community facilitator, and the doctor or nurse. Danger signs for children were asked of the community health worker, the community facilitator, and the doctor or nurse.	Doctor or nurse, community facilitator, CC-approved midwife, and community health worker
3	Care-seeking knowledge and practices for children	Knowledge on child health and healthcare seeking.	Doctor or nurse, community facilitator, and community health worker
4	IYCF practices for infants and children	Knowledge of optimal IYCF practices.	Doctor or nurse, community facilitator, CC-approved midwife, and community health worker

Community questionnaire—The community survey focused on services provided by the community to deal with emergency healthcare issues (**Table 2.3**).

Table 2.3 List of modules included in community questionnaire

Module	Topic	Description	Respondent
1	Interviewees	Information on the individuals present for the community interview.	Community facilitator
2	Community healthcare infrastructure	Information on the availability of healthcare services in the community.	Community facilitator
3	Healthcare personnel	Information on the healthcare staff living in the community.	Community facilitator
4	Community participation in healthcare services	Information on the community's heath care commission and emergency healthcare plan.	Community facilitator

Household questionnaire—The household questionnaire was based on instruments developed by the World Health Organization (WHO), FANTA, and the Demographic and Health Surveys (DHS) (**Table 2.4**). All instruments were adapted to the specific needs of this study.

2.3.3 Fieldwork

Training of interviewers—A variety of methods were used to train the enumerators in the use of the survey questionnaires and Personal Digital Assistants (PDA, see below), including lectures, role-play, discussions of all potential answers to a question, and discussions related to the coding of responses. During training the basic concepts of the PDA were explained, and sufficient time was given to the interviewers and supervisors to become accustomed to the use of the PDA.

Use of PDAs—Enumerators from all three survey teams used a PDA to administer all modules in the household, community, and CC surveys. Interviewers were instructed to briefly explain the use of the PDA to the interviewees before conducting the interview so as to minimize uncertainties about the device. Hard copies of the questionnaires were always carried, in case the PDA was lost or broken.

Standardization of the anthropometry team—The anthropometrists were trained in the use of measuring equipment and the recording of anthropometric data. This included lectures and equipment demonstrations, followed by practical exercises in the measurement of height and weight of infants, children, and mothers. The anthropometrists' height measurements were then standardized[7] according to specific guidelines (Cogill 2003).

Administration of the community and convergence center questionnaires—The questionnaire was administered by a survey team designated specifically to administer these questionnaires. The survey team consisted of three enumerators and one team supervisor. The team was supervised by and reported to the field coordinator.

[7] Interviewers were only standardized in the measurement of height, since weight was measured using an electronic scale.

Table 2.4 List of modules included in household questionnaire

Module	Topic	Source	Description	Respondent
1	Household roster	IFPRI	Information on the composition of the household, including identification of household head, a list of all household members, their age and sex, and their relationship to the head of household, (biological) parents of the children between 0-59 months of age. This section also identifies all children that are from 0-23 months and 0-59 months of age.	Individual in charge of food preparation
2	Household Dietary Diversity	FANTA (Swindale and Bilinsky 2006)	Diversity of the household diet in the last 24 hours.	Individual in charge of food preparation
3	Food Security	FANTA Household Hunger Scale (HHS) (Deitchler et al. 2010)	Hunger status of the household using the FANTA HHS.	Individual in charge of food preparation
4	Maternal knowledge	DHS (www.measuredhs.org), IFPRI	Knowledge on child health, healthcare seeking, feeding, and danger signs during pregnancy and childhood illness.	Primary caregiver of children between 0-23 months of age
5	Pre and postnatal care	DHS	Pre and postnatal care received.	Mother of children between 0-23months of age
6	Feeding practices	WHO (WHO 2008, 2010), IFPRI	Breastfeeding, infant and young child feeding practices.	Mother of children between 0-23months of age
7	Vaccinations and Preventive health	WHO Integrated Management of Childhood Illness (IMCI) (WHO 2005), DHS	Preventive healthcare utilization and vaccinations received.	Mother of children between 0-23months of age
8	Morbidity and healthcare seeking	WHO IMCI, DHS	Morbidity and curative healthcare seeking.	Mother of children between 0-23months of age
9	Household action plan	IFPRI	Status of a household's strategy to improve the health of their members and actions taken to diagnose the overall health of the household.	Individual in charge of food preparation
10	Child anthropometry	-	Child height, weight, and mid-upper arm circumference (MUAC) measurements.	All children between 0-59 months of age
11	Mother anthropometry	-	The mother's height and weight.	Mothers of children between 0-59 months of age

Information on the availability and quality of healthcare provided by the CC was gathered for each CC using a combination of direct observation in health facilities and interviews with health staff. The CC survey was administered on a day when the doctor or nurse did not provide monthly consultations. Questions were asked about the medical equipment and supplies that should be in the CC at all times and those that should only be in the CC the day the doctor or nurse provide consultations. The survey did not verify, however, if these supplies and medicines were actually brought on consultation days.

The knowledge portion of the questionnaire was applied to the doctor or nurse of the CC, a community facilitator, a CC-approved midwife, and a community health worker. In cases where there was more than one of each type of staff working for the CC, the individual interviewed was randomly selected.

The community questionnaire was completed with the community facilitator of the CC.

Administration of the household survey—Two teams administered the household surveys. In each team there were four enumerators, two anthropometrists, a survey editor, and the team supervisor. All field team members were fluent in Q'eqchi'and Spanish and all surveys were conducted in Q'eqchi'. Both teams were supervised by and reported to the field coordinator, the same one that supervised the community and CC survey team. The enumerators applied modules 1-9 and the anthropometrists collected and recorded the anthropometric data (modules 10 and 11).

The survey editor for each team was responsible for reviewing the surveys, for ensuring that the enumerators correctly applied the survey and that the anthropometrists took anthropometric measures from the correct individuals. After the survey was conducted, the survey editor was also responsible for checking the quality of the data before they were downloaded; quality checks included reviewing difficult questions and checking for internal consistency. While the PDA was programmed for internal consistency checks, surveyors may have encountered specific issues in the field that were not considered during programming. If problems were encountered, enumerators returned to the household and corrected the mistakes. Once the editor approved the survey, the supervisors then downloaded the data each night from each completed and approved survey. After supervisor approval, the survey data were sent to the field coordinator who was in charge of cataloging all surveys and maintaining a backup, which was stored in a separate location. In addition to supervising the fieldwork, the field coordinator provided updates to the administrative staff in Guatemala City and MC employees in Cobán. The PDA programmer made frequent trips to the survey area to check the data that were downloaded and correct any problems that occurred in the field. The data were transferred to Guatemala City once all surveys were completed.

2.3.4 Data cleaning and analysis

Data Cleaning—Data downloaded from PDAs by the survey company were transferred to SPSS once all the surveys were completed. Initial data checking and cleaning was conducted by the survey company. IFPRI then conducted another consistency check and full data cleaning (using STATA, version 11) after transferring the data to STATA.

Creation of variables—International organizations and the Government of Guatemala provide several norms and standards against which to assess healthcare provision and outcomes; those used in this study are summarized below. A number of new variables were also created from the baseline data, in order to summarize the results.

1. **CC and community characteristics:**
   Information obtained from the CC and community questionnaires was evaluated against a list of necessary medical supplies and infrastructure that was provided to us by a Guatemalan medical doctor. There are ten essential medications and micronutrient supplements that the CC must have on site.[8] Each community that is serviced by a CC should have health volunteers that work with the CC, and a health commission. Health commissions are

[8] The list is provided by a Guatemalan medical doctor working with Mercy Corps. Vaccinations are brought to the CC by the doctor or nurse every month and are not kept at the CC.

responsible for disseminating community health information, promoting health education, implementing a community emergency plan, and promoting safe disposal of trash.

2. Household hunger and dietary diversity:
Two indicators developed by FANTA were used to evaluate household hunger and dietary diversity.

- **Household hunger scale (HHS)—** Constructed according to FANTA guidelines (Deitchler et al. 2010), with scores assigned to a set of questions about meals and hunger (No food to eat of any kind in your household; go to sleep at night hungry; go a whole day without eating), and frequency of occurrence (Never = 0; Rarely or Sometimes = 1; Often = 2). Scores 0-1 = no hunger; 2-3 = moderate hunger; 4-6 = severe hunger.
- **Household dietary diversity score (HDDS)—**Constructed according to FANTA guidelines (Swindale and Bilinsky 2006); the food preparer in each household was asked if the household had consumed food from 12 pre-defined food groups[9] in the past 24 hours, providing a simple score out of 12. Once HDDS was calculated, we compared the type of food groups consumed by households above and below the median HDDS (The median was 6 in this sample).

3. Knowledge of mothers:
In order to assess knowledge of optimal IYCF and childcare practices, mothers with children between 0-23 months of age were asked a series of questions to assess their knowledge about child feeding (breastfeeding timing and duration, and appropriate complementary feeding practices), the prevention of diarrhea (hygiene practices), how to care for a sick child or a child recovering from an illness (including recognizing danger signs), and danger signs during pregnancy.

4. Preventive healthcare practices:
Preventive healthcare practices were evaluated in relation to Guatemala MSPAS recommendations.

- **Prenatal and postnatal care—**In Guatemala, four prenatal visits are recommended for pregnant women, during which medical staff should take a woman's blood pressure, temperature, and pulse, give a tetanus shot, and provide information on danger signs during pregnancy. Tetanus shots should be given at least twice during pregnancy. MSPAS norms recommend that women take two 300 mg iron tablets and one 5 mg folic acid tablet each week, which are provided free of charge at CCs (MSPAS 2010), subject to availability. The mother and newborn should see a medical professional within 4 days after the birth of the child.
- **Preventive children care practices—**Mothers of children less than 24 months of age were asked about the preventive care sought according to MSPAS recommendations for growth monitoring, vitamin and mineral supplements, and vaccinations (MSPAS 2010). The child's weight, vaccinations, and supplements provided are noted on the

[9] Twelve food groups: Cereals and grains; Roots and tubers; Legumes, nuts and pulses; Milk and dairy products; Eggs; Meat and poultry; Fish and seafood; Fruits; Vegetables; Oils and fats; Sugar, honey, sweets and snacks; Miscellaneous (condiments and drinks, such as coffee or tea).

child's vaccination card along with the date received. Information about these preventive care visits were recorded directly off the vaccination card for the mothers that could present the child's vaccination card at the time of the interview. If the mother could not present the vaccination card, they were asked to recall the preventive care that the child had received. The following variables were analyzed:

- **GMP—**The MSPAS recommends that children are weighed every month up to 24 months of age (MSPAS 2010). CC workers track the child's weight gain on growth curves based on a WHO growth references.[10] The average number of GMP visits was caluclated for children between the ages of 12-23 months.
- **Vitamin and mineral supplements**—There are four types of supplements provided by the CCs for children: iron, folic acid, *Chispitas*,[11] and vitamin A. Children 6-59 months of age should be receiving either iron and folic acid or *Chispitas*. Iron and folic acid should be taken every eight days. *Chispitas* is a MNP that contains iron, zinc, vitamin A, vitamin C, and folic acid, and should be taken daily. A two-month supply of *Chispitas* should be given to children every 6 months *(Chispitas* should be taken four months out of the year). In addition, all children 6-59 months of age should receive a high-dose vitamin A supplement every six months (MSPAS 2010).
- **National vaccination schedule—**Children in Guatemala should receive the following immunizations: BCG (Bacillus Calmette-Guérin, vaccine against tuberculosis) at birth or at first contact with the health services before the age of one year; polio and pentavalent (haemophilus influenza, diphtheria, pertussis, tetanus, and hepatitis B vaccines) at 2, 4, and 6 months of age or as soon as contact is made during the first year of life; MMR (measles, mumps, and rubella) at 12 months of age; and a booster shot for the polio and pentavalent vaccines at 18 months (MSPAS 2010).
- **Full vaccination schedule—**The national vaccination schedule was used to calculate the percentage of children correctly immunized for their age (MSPAS 2010). Two indicators were calculated:
  - At one year of age children should have the BCG, three rounds of polio and pentavalent vaccine, and the MMR vaccines. The percentage of children between the ages of 12 and 17 months having received these vaccines was calculated.
  - At 18 months of age children should have the BCG, three rounds of polio and pentavalent, the first round of booster shots for polio and pentavelent and the MMR vaccines. The percentage of children between 18 and 23 months of age having received these vaccines was calculated as well.

5. Infant and young child feeding (IYCF) practices:

Questions regarding infant and young child feeding recently published by the World Health Organization (WHO 2010) were used to construct the WHO-recommended indicators of breastfeeding and complementary feeding of children 0-23 months of age (WHO 2008).

- **Breastfeeding indicators:**

[10] It is not clear from either the card or the "Normas" document whether the current 2006 WHO growth reference is being used.

[11] *Chispitas* is a micronutrient powder used for home fortification of food. *Chispitas* is now called *Macrovital*, which is produced within Guatemala.

- **Child ever breastfed**—Proportion of children 0-23 months of age ever given breast milk (based on historical recall of the mother).
- **Early initiation of breastfeeding (within 1 hour of birth)—**Proportion of children 0-23 months of age that were put to the breast within one hour of birth (based on recall of the mother).
- **Exclusive breastfeeding of children among children under 6 months—** Proportion of children 0-5 months of age given nothing but breast milk (no other liquids or solids) in the past 24 hours. It must be noted that the indicator does not calculate the percentage of children under the age of 6 months that are exclusively breastfed; it only defines the percentage of children less than 6 months of age that were exclusively breastfed in the last 24 hours. The indicator likely overestimates the children that were exclusively breastfed.
- **Predominant breastfeeding among children under 6 months—**Proportion of children 0-5 months of age given breast milk and any other liquids (including water), but no solids, in the past 24 hours. Those children classified as exclusively breastfed by the previous indicator are also classified as predominantly breastfed, as the previous indicator cannot tell us with certainty that no other liquids were introduced to these children before 6 months of age.
- **Continued breastfeeding at 1 year (12-15 months)—**Proportion of children 12-15 months of age who were breastfed in the past 24 hours.
- **Continued breastfeeding to 2 years (20-23 months)—**Proportion of children 20-23 months of age who were breastfed in the past 24 hours.
- **Age-appropriate breastfeeding—**Proportion of children from birth to 6 months given only breast milk in the past 24 hours, and the proportion of children 6-23 months of age who received breast milk, as well as solid, semi-solid, or soft foods, during the previous day (see next section).
- **Bottle feeding—**Proportion of children 0-23 months of age fed using a bottle in the past 24 hours.
- **Milk feeding frequency for non-breastfed children (≥ 2 milk feedings/day)—** Proportion of non-breastfed children 6-23 months of age given at least two milk feeds in the past 24 hours.

- **Complementary feeding indicators:**
  - **Introduction of solid, semi-solid, or soft foods (between 6-8 months)—** Proportion of children 6-8 months of age given solid, semi-solid, or soft foods in the past 24 hours.
  - **Consumption of iron-rich or iron-fortified foods—**Proportion of children 6-23 months of age that were fed iron-rich food (or food that was fortified with iron and made especially for children) in the previous 24 hours. In Guatemala, food fortified with iron can include CSB and other cereal-based food products, such as Incaparina, Cerelac, or Vitacereal.
  - **Minimum dietary diversity (≥ 4 food groups)—**Proportion of children 6-23 months of age who consumed at least four food groups (out of seven nutrient-rich food groups[12]) in the past 24 hours.

[12] Seven food groups: Grains, roots and tubers; Legumes, nuts and pulses; Milk and dairy products; Eggs; Flesh foods; Vitamin A-rich foods; Other fruits and vegetables.

- **Minimum meal frequency—**Proportion of children, both breastfed and non-breastfed, given a minimum number of meals in the past 24 hours. For breastfed children aged 6-8 months, the minimum number of meals was set at two; for breastfed children aged 9-23 months, the minimum number of meals was set at three and for non-breastfed children, the number of meals was set at four.
- **Minimum acceptable diet—**Proportion of children 6-23 months of age who received the minimum acceptable diet. This indicator was calculated for both breastfed and non-breastfed children. For breastfed children, it was defined as meeting both the minimum dietary diversity and the minimum meal frequency requirements, and for non-breastfed children, it was defined as having received two milk feedings, and meeting both the minimum dietary diversity and the minimum meal frequency.

6. Anthropometric measures:

The mothers' and children's anthropometric data were used to construct the following indicators:

- **Mother's body mass index (BMI)—**Calculated as weight (kg)/height^2 (m^2). Four accepted BMI categories were created: underweight (BMI < 18.5), normal weight (BMI between 18.5 and 25), overweight (BMI between 25 and 30), and obese (BMI > 30) (WHO 1995).
- **Child height-for-age Z-score (HAZ), weight-for-height Z-score (WHZ), and weight-for-age Z-score (WAZ)—**Calculated using the 2006 WHO growth reference (WHO 2006). Stunting was defined as HAZ < -2 standard deviations (SD), wasting as WHZ < -2 SD, and underweight as WAZ < -2 SD.

Data Analysis—The data were analyzed using STATA version 11. In the results section, the variables or indicators of interest are presented as percentages or means and standard deviations as appropriate. In all results tables, the variables and indicators are presented by stratum. For child nutritional status, the results are also presented by sex. The number of missing variables was minimal. The final sample size for all variables and indicators is reported in the results tables.

Comparing results between strata—The comparability of the three strata on relevant variables is presented. To determine if the three strata (study arms ABC, DE, and F) are comparable, we used a fixed effects regression:

$$y_{im} = \alpha_0 + \beta_1 S_{i1} + \beta_2 S_{i2} + \varepsilon_{im} + \mu_m,$$

where y_{im} is the dependent variable and the variable or indicator of interest for the household i (or individual, such as the mother or child) in municipality m. We included two dummy variables (S_{i1} and S_{i2}) for strata DE and F, respectively. Stratum ABC was set as the reference group. The error term is ε_{im}, which has a normal distribution with mean 0 and variance σ^2. Unobserved heterogeneity between the municipalities is μ_m. If β_1 and β_2 are not significantly different from zero ($p < .05$) then the variable or indicator of interest does not differ between the strata, or the variable or indicator of interest is comparable between the three strata. If β_1 (β_2) is statistically significant from zero ($p > .05$), then the variable or indicator of interest in stratum DE (stratum F) is significantly different than the reference group, stratum ABC. To test the difference between DE and F, the reference group was changed to F. Having β_1 or β_2 statistically significant

from zero indicates that there are statistically significant differences between the strata, but even in absence of true differences between strata, it is to be expected that at $\alpha = 0.05$, 5 percent of the tests will result as significant; only a larger percentage of differences found indicate that the strata were not comparable. Variables that have significant differences between the strata are marked in bold.

3. Results

3.1 Convergence Center and Community Characteristics

3.1.1 Convergence centers

The majority of CCs were staffed by a graduated nurse (86.7%) rather than a doctor (13.3%) (**Table 3.1**). All CCs had an institutional facilitator, a CC-approved midwife, and a community facilitator. However, only 88.9 percent of CCs had a community health worker. Therefore only 88.9 percent of CCs had a full EBS. Several CCs had optional staff, such as a traditional midwife (8.9%), a technical worker (26.7%), and a health educator (68.9%).

Table 3.1 Convergence center (CC) characteristics[a]

Characteristic	N = 45
Personnel: percent CCs that had at least 1…	
Doctor	13.3
Nurse	86.7
Institutional facilitator	100.0
CC approved midwife	100.0
Community facilitator	100.0
Community health worker	88.9
Has basic health team	88.9
Optional staff: percent CCs that had at least 1…	
Traditional midwife	8.9
Technical worker	26.7
Health educator	68.9
Infrastructure: percent CCs that had…	
Own building	82.2
Bathroom	75.6
Electricity	24.4
Cement floor	77.8
Medical equipment: percent CCs that had at least 1…	
Hospital bed	82.2
Adult scale	95.6
Children scale	100.0
Fixed height board	20.0
Portable height boards	40.0
Blood pressure monitor	28.9
Stethoscope	31.1
Thermometer	35.6
Essential medicine and micronutrient supplements: percent CCs that had…	
ORS	82.2
Amoxicillin	93.3
Trimetroprim-Sulfametoxazole	68.9
Penicillin	80.0
Albendazole	88.9
Children supplements	
Vitamin A	2.2
Chispitas	44.4
Women supplements	
Iron	93.3
Folic acid	88.9
Prenatal supplements	11.1

[a] Values are mean (SD) or percent.

The majority of CCs were located in a building not used for other purposes (82.2%). Many CCs had a bathroom (75.6%) and had cement floors (77.8%), but only a quarter of CCs had electricity.

Most CCs had hospital beds in order to examine patients (82.2%) and the necessary equipment to weigh both adults (95.6%) and children (100.0%). Few CCs had height boards to measure adults (20.0%) or children (40.0%). Furthermore, the basic equipment needed to examine pregnant women and young children was lacking: less than 30 percent of CCs had the necessary equipment to take a patient's blood pressure, 31.1 percent had a stethoscope, and 35.6 percent had a thermometer.

On average, CCs had available 5.7 of the 10 essential medications and vitamin and mineral supplements expected. The most common medicines were ORS (82.2%), amoxicillin (93.3%), penicillin (80.0%), and albendazole (88.9%). CCs also had on hand vitamin and mineral supplements for women: iron (93.3%), folic acid (88.9%), and prenatal supplements (11.1%). Nutritional supplements that are necessary for children under two years of age were in short supply; only 2.2 percent had vitamin A and less than half (44.4%) had *Chispitas*.

3.1.2 Community healthcare staff

Communities had, on average, 2 or 3 CC-approved midwives, 1.1 community facilitators, and 4.9 community health workers (**Table 3.2**). Almost all communities had a health commission (97.8%), which had, on average, 5.4 members.

Table 3.2 Community characteristics[a]

Characteristic	N = 45
Community healthcare staff:	
CC-approved midwife	2.4 (1.5)
Community facilitator	1.1 (0.4)
Community health worker	4.9 (4.0)
Percent that had a health commission	97.8
Number of members	5.4 (1.4)

[a] Values are mean (SD) or percent.

3.1.3 Knowledge of trained health staff

Over 85 percent of healthcare workers stated that babies should be put to breast either immediately or less than one hour after birth and that they should be given colostrum (**Table 3.3**).[13] When asked if children less than 6 months of age could be given water or other liquids, 85.1 percent responded that they should not be given water, and 71.4 percent said that they should not be given liquids besides water. While a high percentage of health staff (88.9%) stated that they knew why exclusive breastfeeding was important for children less than 6 months, there was a substantial number of health staff (28.6%) that thought children could be given water or other liquids before 6 months of age. This indicates they may not clearly understand the definition of exclusive breastfeeding. The average age stated for introduction of semi-solid foods was 6.8 months, almost one month later than recommended, and 16.9 percent said that semi-solid foods should be introduced after the child is 6 months of age.

[13] Correct responses to knowledge questions are provided in **Appendix C**.

Table 3.3 Healthcare worker knowledge of child feeding and care practices[a]

Child feeding and care practice	N = 154
Feeding knowledge: percent who gave right answer:	
Children should be breastfed less than one hour after birth	86.4
Baby should be given colostrum	85.1
Baby should not drink water < 6 months	80.5
Baby should not drink other liquids <6 months	71.4
Baby should receive semi-solid foods at 6 months	81.8
Reported age in months at which children would receive semi-solid foods	6.8 (2.9)
	N = 109
Ways of preventing diarrhea: percent who said…[b]	
Wash child's hands	82.6
Clean fruits and vegetables	68.8
Keep children's clothes clean	34.9
Don't let children sit on ground	22.9
Give child purified water	54.1

[a] Values are mean (SD) or percent.
[b] Interviewee could provide more than one answer.

When asked the open-ended question on the methods that mothers should use to prevent diarrhea in children, the most commonly cited practices were washing a child's hands (82.6%), cleaning fruits and vegetables (68.8%), and giving a child purified water (54.1%). Few health staff mentioned washing one's own hands.[14]

When healthcare workers were asked to name all the danger signs of childhood illness that they knew, the most common danger sign mentioned was fever (72.5%) (**Table 3.4**). Healthcare workers also mentioned fast breathing (50.5%) and difficulty breathing (52.3%). Very few (1.8%) mentioned bloody stools. The average number of the six possible danger signs mentioned was higher than that of mothers (see Section 3.4), but it was still low (2.2).

Healthcare workers, on average, could mention 3.1 danger signs of pregnancy out of the 8 possible danger signs. Vaginal bleeding was mentioned by 89.6 percent, severe headaches by 81.7 percent, and pelvic or abdominal pain by 56.5 percent. Few healthcare workers mentioned persistent back pain (6.9%), regular contractions prior to 37 weeks (6.9%), and no fetal movement (3.5%).

[14] Healthcare workers were asked to list the number of ways to prevent diarrhea in their children. Enumerators were instructed to not rush the answer and to ask the healthcare worker "what else" once he/she stopped talking. Once the healthcare worker mentioned that he/she did not know any more methods to prevent diarrhea, the enumerator was allowed to proceed to the next question. This method was used for all knowledge questions.

Table 3.4 Healthcare worker knowledge of danger signs that require medical attention[a]

Signs that require medical attention	N = 109
Danger signs of childhood illness: when a child should receive medical attention: percent who responded[b]	
Child not able to drink or breastfeed	32.1
Child becomes sicker	12.8
Child develops a fever	72.5
Child has fast breathing	50.5
Child has difficulty breathing	52.3
Child has blood in the stool	1.8
Total signs mentioned out of six	2.2 (1.2)
	N = 115
Danger signs of pregnancy: when a pregnant woman should receive medical attention: percent who responded[b]	
Vaginal bleeding	89.6
Pelvic or abdominal pain	56.5
Persistent back pain	6.9
Gush of fluid from vagina	26.9
Swelling of the hands/face	34.8
Severe headaches, blurry vision	81.7
Regular contractions prior to 37 weeks	6.9
No fetal movement	3.5
Total signs mentioned out of eight	3.1 (1.1)

[a] Values are mean (SD) or percent.
[b] Interviewee could provide more than one answer.

3.2 Household Characteristics

The average household size was 5.3 people with an average of two adult members, 3.4 members under 18 years of age, and 1.4 children less than 60 months old (**Table 3.5**); less than half of household members (43.0%) were older than 18 years of age. There were 1.4 dependents in the household for each nondependent. The average age of the household head (92.9% male) was 32.1 years.

Over 60 percent of the sample households had a member that was eligible for the program (i.e., a pregnant woman or a child 0 to 23 months of age) and 5.3 percent had two or more potential beneficiaries. Of all households, 10.6 percent had a pregnant woman, 11.7 percent had a child less than 6 months of age, and 43.3 percent had a child between 6-23 months of age.

Houses were generally small and of poor quality. The average house had 2.2 rooms, and 14.8 percent of the study sample lived in a one-room house (**Table 3.6**). About half of the households had a kitchen located inside the house, but in approximately 77.7 percent of houses, the kitchen also served as a bedroom. The majority of houses had dirt floors (85.7%), wooden walls (61.9%), and an aluminum roof (93.4%). Most households used a latrine (81.9%). Only a small percentage had a toilet that could be flushed manually by adding water (14.8%). The most common sources of water were rainwater (44.2%), and spring or river water (32.8%). Only 15.8 percent of households had access to electricity.

Table 3.5 Household characteristics[a]

	Households with children 0-59 months of age

	Full sample	Stratum		
		ABC	DE	F
	N = 1,308	N = 435	N = 437	N = 436
Household				
Household size	5.3 (2.3)	5.3 (2.4)	5.4 (2.3)	5.2 (2.2)
Number of adults (≥ 18 years old)	2.0 (0.6)	2.0 (0.6)	2.0 (0.6)	2.0 (0.6)
Number of children	3.4 (2.2)	3.4 (2.3)	3.4 (2.2)	3.3 (2.2)
Number of children 0-59 months of age	1.4 (0.6)	1.4(0.6)	1.4 (0.6)	1.4 (0.6)
Percent adults: (members ≥ 18years/household size) x 100)	43.0	43.0	42.2	43.8
Dependency Ratio[b,c]	1.4 (0.8)	**1.4(0.8)**	**1.4 (0.8)**	**1.3 (0.7)**
Household head				
Age of household head (years)	32.1 (8.2)	31.6 (7.5)	32.6 (9.0)	31.9 (7.9)
Sex of household head (percent male)	92.9	**91.3**	**93.1**	**94.5**
Percent of households with…				
PROCOMIDA eligible household member (pregnant or child 0-23 months of age)	60.9	64.4	59.7	58.5
Pregnant woman	10.6	10.6	11.7	9.6
Child 0-5 months of age	11.7	14.3	9.4	11.5
Child 6-23 months of age	43.3	44.4	44.6	40.8
Number of potential beneficiaries per household	0.7 (0.6)	0.7 (0.6)	0.7 (0.6)	0.6 (0.6)

[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the strata.
[b] N = 1,307, because one of the nuclear households is a single mother who is 14 years of age.
[c] (Number of household members < 15 y or > 64 y)/(Number of members 15-64 years).

Table 3.6 Housing quality[a]

	Households with children 0-59 months of age			
		Stratum		
	Full sample	ABC	DE	F
	N = 1,307	N = 435	N = 436	N = 436
Number of rooms	2.2 (0.9)	2.3(0.9)	2.3(0.9)	2.2(0.9)
Kitchen				
Kitchen in house	52.7	50.6	54.1	53.4
Kitchen doubles as bedroom	77.7	81.8	73.6	77.5
Housing quality				
Type of floor				
Dirt	85.7	**86.7**	**84.9**	**85.6**
Concrete	13.9	**13.1**	**14.4**	**14.2**
Type of wall				
Wood	61.9	52.2	69.3	64.4
Palm	14.5	22.3	6.9	14.5
Cement	14.4	**16.1**	**13.3**	**13.8**
Type of roof				
Aluminum	93.4	**88.7**	**97.5**	**94.0**
Water, sanitation, and electricity				
Water source				
Rainwater	44.2	**28.9**	**56.2**	**47.5**
Spring or river	32.8	**40.5**	**19.5**	**38.5**
Faucet in home or yard	16.8	**25.3**	**16.1**	**9.2**
Other water source[b]	4.1	2.8	5.7	3.7
Type of restroom				
Latrine	81.9	**77.0**	**80.9**	**87.8**
Toilet with manual flush	14.8	**18.6**	**15.6**	**10.3**
Electricity	15.8	**17.0**	**13.3**	**16.9**

[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the strata.
[b] Other water sources include public well water, public faucet, or bottled water.

On average, mothers were 28.1 years of age and married (**Table 3.7**). All mothers were female. The majority of children (99.0%) were cared for by their biological mother; other children were

cared for by their grandmothers or stepmothers. Ninety-eight percent of women were of Mayan ethnicity and spoke Q'eqchi'; 35.7 percent said that they could read Q'eqchi'. Knowledge of Spanish was not common: a mere 29.1 percent of mothers stated that they could understand Spanish, 20.4 percent could speak Spanish, and 34.9 percent could read Spanish.

The small number of statistically significant differences that were found between strata (marked in bold)—and where statistical differences were found, the generally small magnitude and lack of specific trend in the differences (i.e., one group was not systematically worse or better than the other two)—suggests that there were no systematic or meaningful differences between strata.

Table 3.7 Characteristics of the mother[a]

	Mothers with children 0-59 months of age			
		Stratum		
	Full sample	ABC	DE	F
	N = 1,308	N = 435	N = 437	N = 436
Age (years)	28.1(7.2)	28.1(7.0)	28.2(7.3)	28.1(7.3)
Has a spouse or partner (percent)	93.2	**91.5**	**93.4**	**94.7**
Ethnicity and language				
Maya ethnicity	98.9	99.5	98.6	98.6
Speaks Q'eqchi'	98.0	**95.6**	**98.6**	**99.7**
Reads Q'eqchi'	35.7	**29.7**	**36.6**	**40.8**
Understands Spanish	29.1	28.0	32.3	27.1
Speaks Spanish	20.4	20.2	22.8	18.1
Reads Spanish	34.9	**30.3**	**36.4**	**37.8**

[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the strata.

3.3 Household hunger and dietary diversity

In the four weeks preceding the survey, approximately 16.4 percent of households had at least one family member that had to skip a meal, 8.8 percent had at least one member that went to bed hungry, and 6.3 percent had at least one member that did not eat for a whole day (**Table 3.8**). However, the majority of households responded that these events occurred less than two times in the past four weeks. Among sample households, therefore, the prevalence of hunger was relatively low: no households were classified as having severe hunger, and 8.8 percent of sampled households had moderate hunger.

On average, households consumed 5.8 food groups out of 12 in the past 24 hours. This seemingly acceptable level of dietary diversity, however, did not necessarily represent a healthy diet. The most commonly consumed food groups were cereals, sugar, the miscellaneous group (including coffee, tea, and condiments), oil and fats, pulses and legumes, and eggs (**Figure 3.1**). The consumption of micronutrient-rich foods was low; only 41.8 percent of households had consumed meat in the day preceding the interview, and the proportion of households consuming fruits (16.8%), vegetables (6.5%), and dairy (7.8%) was even lower. The most common food groups consumed were cereals, sugars, or miscellaneous (**Figure 3.2**). Households who consumed fewer than 6 groups were much less likely than those with higher dietary diversity to consume micronutrient-rich foods such as pulses, eggs, meat, fruits, vegetables, fish, and dairy. They were also less likely to consume fats and tubers.

Table 3.8 Household hunger and dietary diversity[a]

	Households with children 0-59 months of age	
		Stratum

	Full sample	ABC	DE	F
	N = 1,301	N = 435	N = 435	N = 431
Household hunger				
No food in house[b]	16.4	**15.2**	**12.6**	**21.6**
Went to bed hungry	8.8	8.7	7.6	10.2
Did not eat for a whole day	6.3	**4.8**	**5.3**	**8.8**
Household hunger scale				
Little or no hunger	91.2	**91.9**	**93.1**	**88.4**
Moderate hunger	8.8	**8.0**	**6.9**	**11.6**
Severe hunger	0.0	0.0	0.0	0.0
Household dietary diversity				
Household Dietary Diversity Scale (DDS)	5.8 (1.6)	5.8 (1.6)	5.9 (1.5)	5.8 (1.7)
Percent with HDDS < 6	40.8	43.9	35.2	43.4

[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the strata.
[b] Due to a mistake in the implementation of the fieldwork, rather than asking about "no food during the entire day," the question asked was if there was no food at anytime of the day. The household hunger indicator was recalculated assuming that no households reported an entire day without food in the house in order to test the sensitivity of the question on the outcomes of interest. The percentage of households with little hunger would increase to 95.3 from 91.2 and moderate hunger would drop to 4.7 from 8.8.

Figure 3.1 Household dietary diversity: Food groups consumed

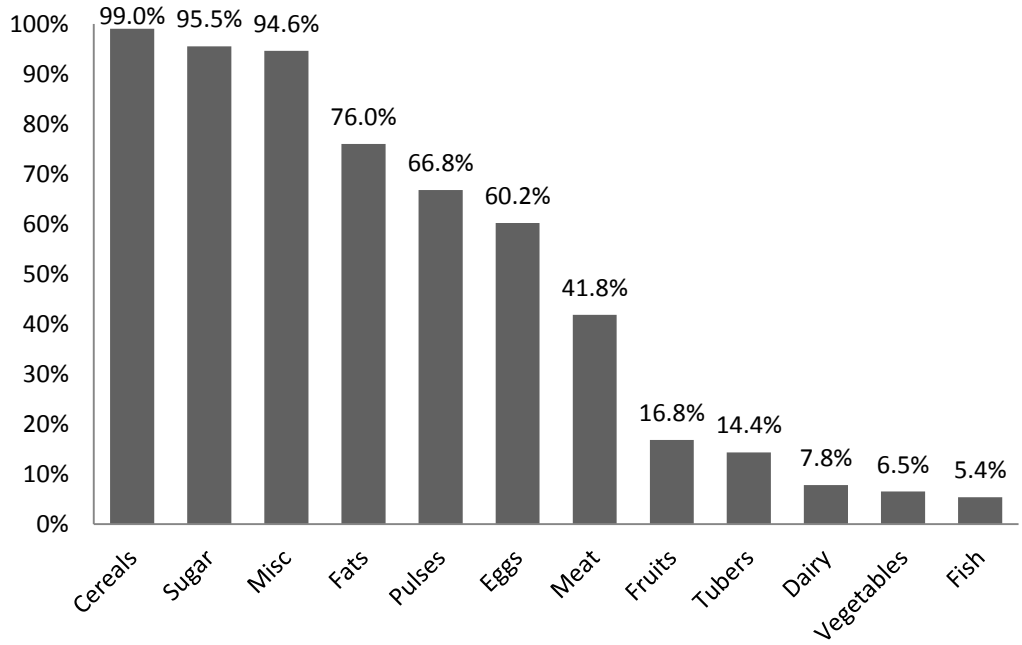
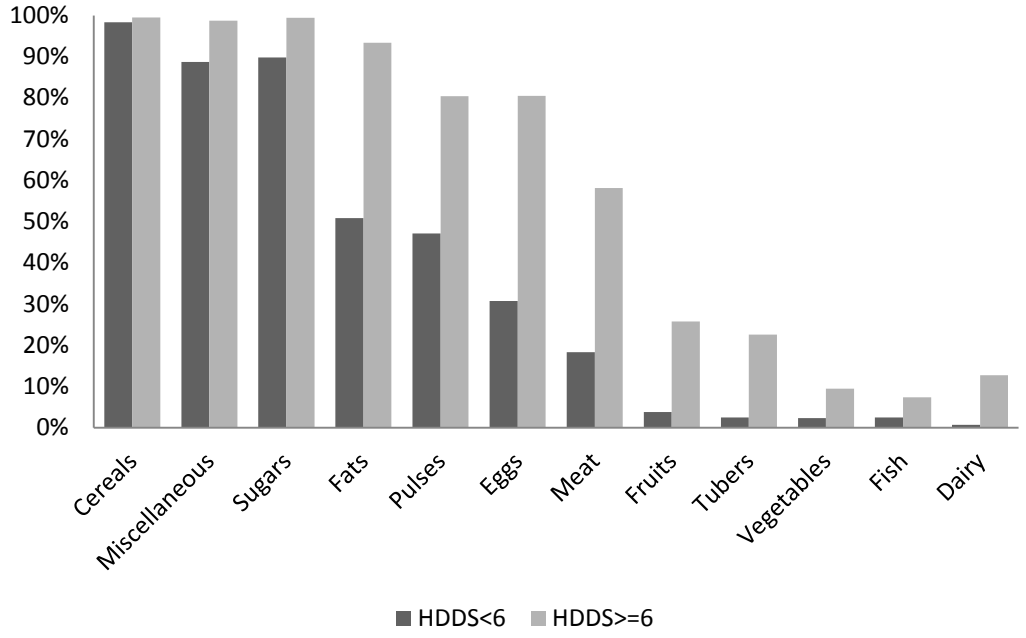


Figure 3.2 Food groups consumed, by household dietary diversity score category



Variables in bold in Table 3.8 are significantly different between the strata. Members of households in the control stratum were more likely to have skipped a meal or to not have eaten for a whole day in the last four weeks. There were no differences between strata in household dietary diversity.

3.4 Feeding, care, and health knowledge of mothers

Feeding practices—Over 80 percent of mothers knew that a child should be breastfed within one hour of birth and that colostrum should be given to newborns (**Table 3.9**).[15] Maternal knowledge was similar to that of health staff on these issues (see Section 3.1.3). The majority of women responded that children less than 6 months of age should not drink water (71.6%) or other types of liquids (83.3%). On average, mothers responded that children can start to receive liquids at 7.3 months of age and start to receive semi-solid foods when they are 7.4 months old. About half of the women gave the age of 6 months for the introduction of liquids or the introduction of semi-solid foods, the correct response. Of those who did not know the correct response, the majority responded that liquids and solid foods should be introduced later than six months.

Preventing diarrhea—Knowledge on how to prevent diarrhea was limited.[16] Mothers mentioned washing the child's hands (78.7%), keeping the child's clothes clean (57.3%), and washing fruits and vegetables before eating them (28.4%). Only 6.4 percent, however, mentioned the importance of giving the child clean water and no one mentioned washing their own hands.

[15] Correct responses to knowledge questions are provided in **Appendix C**.

[16] Primary caregivers were asked to list the number of ways to prevent diarrhea in their children. Enumerators were instructed to not rush the answer and to ask the primary caregiver "what else" once she stopped talking. Once the primary caregiver mentioned that she did not know any more methods to prevent diarrhea, the enumerator was allowed to proceed to the next question. This method was used for all knowledge questions.

Thirty-two of mothers (4.5%) could not mention any preventive method **(Table 3.10).** Health staff had better knowledge on this topic than mothers did.

Table 3.9 Feeding knowledge of mothers[a]

	Mothers of children 0-23 months of age			
	Full sample	Stratum		
		ABC	DE	F
	N = 708	N = 249	N = 234	N = 225
Feeding knowledge: percent who gave right answer:				
Children should be breastfed less than one hour after birth[b]	82.5	81.7	84.9	80.7
Children should be given colostrum	86.3	84.3	89.3	85.3
Children < 6 months of age should not drink other liquids	71.6	70.3	70.9	73.8
Children < 6 months of age should receive semi-solid foods	83.3	82.3	84.6	83.1
Reported age in months at which children should receive liquids[c]	7.3 (3.5)	**7.5 (4.4)**	**7.4 (3.4)**	**6.9 (2.2)**
Percent women who said 6 months	52.6	51.8	48.7	57.6
Percent women who said < 6 months	6.8	7.6	6.8	5.8
Percent women who said > 6 months	40.6	40.5	44.4	36.6
Reported age in months at which children should receive semi-solid foods	7.4 (3.0)	7.4 (2.5)	7.6 (4.3)	7.2 (1.8)
Percent women who said 6 months	49.8	49.8	48.3	51.6
Percent women who said < 6 months	2.1	2.0	2.9	1.3
Percent women who said > 6 months	48.0	48.2	48.7	47.1

[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the strata.
[b] Seven mothers responded that they did not know.
[c] One mother responded that she did not know.

Treating diarrhea—When asked how to care for a child with diarrhea, 67.4 percent of mothers said that they should be given oral rehydration salts (ORS), 30.4 percent mentioned that children should be given local or traditional remedies, and 29.4 percent mentioned that a child should be taken to a local healthcare facility. Few women mentioned that children should be given purified water (5.2%) and continue to be breastfed (2.8%). Almost all mothers, however, knew what ORS was (**Table 3.10**).

Caring for a sick or recovering child and identifying danger signs—The majority of mothers did not know how to properly feed or provide liquids to a child during illness or recovery (**Table 3.10**).[17] Almost all caregivers (90.5%) believed that children should be fed less when sick and 43.7 percent said that children should be given less liquid. During convalescence, only 39.3 percent of caregivers responded that children should be fed more.

Indicators that a child needs to be taken to a health professional (the so-called danger signs) were poorly understood: on average, mothers could only mention 1.3 of the six danger signs, which was even lower than the 2.2 danger signs mentioned by health staff (Section 3.1.3). The most common sign mentioned was fever (59.9%). All other danger signs were mentioned by less than 15 percent of mothers (**Table 3.11**). Four percent of mothers could not mention one danger sign and 66.9 percent mentioned only one danger sign.

[17] Correct responses to knowledge questions are provided in **Appendix C**.

Table 3.10 Health and care knowledge of mothers[a]

	Mothers of children 0-23 months of age			
		Stratum		
	Full sample	ABC	DE	F
	N = 708	N = 249	N = 234	N = 225
Preventing diarrhea: percent who said…[b, c]				
Wash child's hands	78.7	84.7	84.6	78.1
Keep children's clothes clean	57.3	65.5	54.3	62.8
Clean fruits and vegetables	28.4	30.8	29.4	28.4
Don't let children sit on ground	17.5	**14.6**	**20.4**	**19.5**
Give child purified water	6.4	**8.3**	**5.9**	**5.6**
Treating diarrhea: percent who said…[c, d]				
Give ORS	67.0	64.3	67.5	69.6
Give traditional medicine	30.4	31.3	33.8	25.9
Take to medical center	29.4	29.3	27.8	31.3
Give purified water	5.2	**7.6**	**2.6**	**5.4**
Continue breastfeeding	2.8	2.4	2.9	3.1
Percent who knew of ORS	96.0	95.6	96.2	96.4
Feeding a sick child: percent who said…				
Feed less	90.5	92.4	88.5	90.7
Feed the same	4.9	4.4	5.6	4.9
Feed more	4.5	3.2	5.9	4.4
Giving liquid to a sick child: percent who said…				
Less liquids	43.7	46.2	40.6	44.0
Same amount of liquids	6.1	6.0	5.6	6.7
More liquids	50.3	47.8	53.9	49.3
Caring for child recovering from sickness: percent who said…				
Feed less food	29.8	34.1	27.8	27.1
Feed the same amount of food	30.9	32.1	31.6	28.9
Feed more food	39.3	33.7	40.6	44.0

[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the strata.
[b] Thirty-two mothers responded that they did not know.
[c] Answers were open-ended and mothers could provide multiple answers.
[d] One mother responded that she did not know.

Recognizing the common danger signs of pregnancy—Mothers mentioned an average of 1.9 common danger signs of pregnancy out of eight, which was considerably lower than the 3.1 signs mentioned by the health staff (Section 3.1.3). The most common signs mentioned were persistent back pain (57.2%), severe headaches or blurry vision (42.5%), vaginal bleeding (31.2%), pelvic or abdominal pain (25.8%), and swelling of hands or face (24.0%). Less than 5 percent mentioned the gush of fluid from the vagina, early contractions, or no fetal movement (**Table 3.11**). Ten percent of mothers could not mention one danger sign, while a quarter of mothers knew only one sign and approximately 60 percent knew two or three signs.

There were no meaningful differences in mother knowledge between the three strata. The few differences found are highlighted in bold in Tables 3.9-3.11.

Table 3.11 Mother's knowledge of danger signs that require medical attention[a]

	Mothers of children 0-23 months			
		Stratum		
	Full sample	ABC	DE	F
	N = 708	N = 249	N = 234	N = 225
Danger signs of childhood illness: when a child should receive medical attention: percent who responded…[b]				
Child not able to drink or breastfeed	9.9	9.6	9.8	10.2
Child becomes sicker	13.4	13.7	14.5	12.0
Child develops a fever	89.9	89.2	90.2	90.7
Child has fast breathing	6.4	8.0	4.3	6.7
Child has difficulty breathing	5.2	5.2	5.6	4.9
Child has blood in the stool	4.8	**4.0**	**5.6**	**4.9**
Total signs mentioned out of six	1.3 (0.6)	1.3(0.7)	1.3(0.6)	1.3(0.7)
Danger signs of pregnancy: when a pregnant woman should receive medical attention: percent who responded…[b]				
Persistent back pain	57.2	61.0	55.1	55.1
Severe headaches, blurry vision	42.5	43.7	41.5	42.2
Vaginal bleeding	31.2	26.1	32.9	35.1
Pelvic or abdominal pain	25.8	32.1	18.8	26.2
Swelling of the hands/face	24.0	22.5	26.5	23.1
Gush of fluid from vagina	3.5	3.2	2.6	4.9
Regular contractions prior to 37 weeks	2.8	2.4	3.4	2.7
No fetal movement	2.3	**2.0**	**0.9**	**4.0**
Total signs mentioned out of eight	1.9 (1.1)	1.9(1.1)	1.8(1.1)	1.9(1.0)

[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the strata.
[b] Answers were open-ended and mothers could provide multiple answers.

3.5 Preventive healthcare practices

3.5.1 Prenatal care seeking

Prenatal healthcare seeking was found to be adequate (**Table 3.12**). Ninety-seven percent of women visited a medical professional during pregnancy. The majority of women met with medical professionals at a CC (90.7%). Some pregnant women also went to other types of healthcare facilities; 18.9 percent visited government-run healthcare facilities and 4.2 percent went to private clinics. Pregnant women had, on average, 5.5 prenatal visits with a medical professional,[18] which is higher than the number required by the MSPAS (four visits are recommend by MSPAS).

This survey does not allow the evaluation of quality of prenatal care, but the results suggest that coverage of different prenatal services, such as tetanus shots (61.2%) and blood pressure measurements (94.4%), was high for those attending.

More than 95 percent of women took nutritional supplements, 87 percent of women took iron pills, 84.3 percent took folic acid pills at some time during their pregnancy, and 76.7 percent took both iron and folic acid supplements. Only 23 percent of woman, however, reported that they followed the recommended dosage for iron supplements, two tablets per week. The majority of "other" took the iron supplements once per week. The opposite picture was seen for folic acid: 61 percent took folic acid pills according to MSPAS recommendations (one tablet a week), 22.8 percent took folic acid twice a week, and 12 percent took the supplements once a day. On average, women took iron and folic acid pills for 21 weeks of their pregnancies. Furthermore,

[18] Defined as visiting a convergence center, a government-funded medical center, a private hospital or a clinic.

20.7 percent of women took other prenatal vitamins during their pregnancy. Again, there were few meaningful differences between the strata in the use of prenatal care services. There were slight differences in the percentage of women that had prenatal care, sought prenatal care from a community health worker, and received folic acid supplements.

Table 3.12 Use of prenatal care services[a]

	Prenatal care for children 0-23 months of age			
		Stratum		
	Full sample	ABC	DE	F
	N = 720	N = 258	N = 235	N = 227
Had prenatal care: percent who used…	96.8	**95.3**	**97.0**	**98.4**
Community health worker	2.4	**3.2**	**0.9**	**3.1**
Convergence center	90.7	90.2	89.5	92.4
Government funded medical center	18.9	23.6	17.9	14.8
Private hospital or clinic	4.2	3.2	5.7	3.6
Number of prenatal care visits				
All visits	5.5 (2.6)	6.0 (2.3)	5.4 (2.5)	5.7 (2.3)
Visits in medical facility	5.4 (2.5)	5.9 (2.4)	5.3 (2.4)	5.5 (2.4)
Services provided at prenatal visits: percent who…				
Received a tetanus shot	61.2	60.9	61.4	60.1
Had blood pressure taken	94.5	95.1	94.3	94.2
Percent who took supplements of…	95.7	95.3	95.3	96.5
Iron	87.4	86.0	86.4	89.9
Folic acid	84.3	**88.4**	**79.6**	**84.6**
Other prenatal vitamins	20.7	20.2	24.7	17.2

[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the strata.

3.5.2 Newborn and postnatal care

Notwithstanding the large proportion of pregnant women seeking prenatal care, the majority of deliveries were at home (65.0%). Deliveries were mainly attended by the CC-approved midwife (52.5%), or medical staff (35.1%), such as a doctor or a nurse. Less than 8 percent of births were attended by a health volunteer in the community and 4.7 percent by a traditional midwife (**Table 3.13**).

The majority of newborns received essential newborn care: 75.0 percent of children were put to the breast within one hour of birth, 98.8 percent were wiped immediately after birth, and 99.0 percent were wrapped. Only about 44 percent of mothers and newborns were seen by a CC-approved midwife (19.7%) or a doctor or a nurse (24.5%) within four days of birth. No differences between strata were found for any of the newborn care practices assessed, except visits by the CC-approved midwife during the first four days following birth.

Table 3.13 Newborn and postnatal care practices[a]

	Births of children 0-23 months of age			
		Stratum		
	Full sample	ABC	DE	F
	N = 720	N = 258	N = 235	N = 227
Location of birth: percent who…				
Delivered at home	65.0	63.2	62.6	69.6
Delivered at health facilities	34.4	36.4	36.6	30.4
Medical Staff at birth: percent who had presence of…				
CC approved midwife	52.5	46.9	53.2	58.1
Doctor or nurse	35.1	**37.6**	**37.0**	**30.4**
Local health volunteers	7.5	7.8	7.2	7.5
Untrained midwife	4.7	6.6	2.9	4.4
Newborns who received essential newborn care				
Percent children born in the last 23 months who were put to the breast within 1 hour of birth	75.0	73.3	76.7	75.3
Percent children born in the last 23 months who were dried (wiped) immediately after birth before the placenta was delivered	98.8	99.6	97.9	98.7
Percent children born in the last 23 months who were wrapped in a arm cloth or blanket immediately after birth before the placenta was delivered	99.0	99.6	98.3	99.1
Postnatal care < 4 days after birth: percent who were seen by…				
CC-approved midwife	19.7	15.1	22.6	24.2
Doctor or nurse	24.5	27.5	20.4	23.3
Local health volunteers	6.1	7.4	4.3	6.6

[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the strata.

3.5.3 Preventive care for children 0-23 months of age

Ninety-one percent of mothers said they had a vaccination card for their child less than 24 months of age, and the majority (88.9%) could show the vaccination card at the time of the interview (**Table 3.14**). On average, children between 12 and 23 months of age attended 8.4 growth monitoring visits in the past 12 months, a little over half the recommended number.[19]

Children between the ages of 12 and 23 months of age should receive vitamin A and *Chispitas* or iron and folic acid. In the last six months, less than half of children had received a vitamin A mega-dose (45.1%) and only 23.2 percent of children received *Chispitas*. Iron and folic acid supplement use was also low, at 47.3 percent and 43.5 percent, respectively, while 42.7 percent of children had received both iron and folic acid.[20] More than half of children had received either iron and folic acid or *Chispitas* in the last six months (53.2%). A small percentage had received *Chispitas* and iron and folic acid supplements (12.7%).

The majority of children between the ages of 12 and 17 months and between the ages of 18- 23 months had received the BCG vaccine and the first three polio and pentavalent vaccines. The percentage of children that received the booster shots of polio and pentavalent was considerably lower (73.6% and 69.1%, respectively). The percentage of children having received the MMR vaccine was considerably lower in the group 12 to 17 months of age (80.2%) than in the group 18 to 23 months of age (95.5%). The percentage of children with a full set of vaccinations dropped with age, from 77.6 percent between the ages of 12 and 17 months to 68.5 percent

[19] Percentages could only be calculated for children with vaccination cards.

[20] Percentages could only be calculated for children with vaccination cards.

between 18 and 23 months. Children appear to be immunized later than recommended, as indicated by the percentage of children that received MMR increased with age.

There were no meaningful differences between strata on any of the preventive care variables. The few differences found are highlighted in bold in **Table 3.14**.

Table 3.14 Child preventive care practices[a]

	Children 0-23 months of age			
		Stratum		
	Full sample	ABC	DE	F
	N = 725	N = 258	N = 238	N = 229
Percent who have a vaccination card	90.8	93.4	88.2	90.4
Percent who could show vaccination card for inspection	88.9	91.5	86.1	88.6
Growth monitoring for children between 12-23 months[b]				
Percent who attended growth monitoring in last 12 months	99.4	98.4	100.0	100.0
Number of times attended in last 12 months	8.4 (3.2)	**8.1 (3.4)**	**8.1 (3.1)**	**8.9 (2.8)**
Percent who received supplements in last 6 months for children between 12-23 months[b]				
Vitamin A	45.1	48.1	43.9	43.1
Iron	47.3	**50.3**	**43.1**	**48.3**
Folic acid	43.5	**48.8**	**36.6**	**44.8**
Chispitas	23.2	17.6	29.3	23.3
Iron and folic acid	42.7	**47.3**	**36.6**	**43.9**
Iron and folic acid or *Chispitas*	53.2	55.7	50.4	53.4
Vaccination 12-17 month old children; percent children who had received…				
BCG	98.9	100.0	98.8	98.1
MMR	80.2	81.7	81.3	76.9
Pentavalent 3	94.8	94.8	96.3	88.5
Polio 3	94.3	94.3	96.7	88.5
Number of vaccines received out of 8	7.6 (0.9)	7.8 (0.6)	7.7 (0.6)	7.3 (1.5)
Percent fully immunized for age	77.6	81.7	78.8	71.2
Vaccination 18-23 month old children: percent children who had received…				
BCG	98.9	100.0	97.7	98.4
MMR	95.5	95.8	97.7	93.8
Pentavalent 3	98.8	98.6	100.0	98.4
Polio 3	98.5	98.6	100.0	98.4
Booster for polio	73.6	67.6	81.4	75.0
Booster for pentavalent	69.1	66.2	67.4	73.4
Number of vaccines received out of 10	9.3 (1.2)	9.3 (1.1)	9.4 (0.9)	9.3 (1.5)
Percent fully immunized for age	68.5	66.2	65.1	73.4

[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the strata.
[b] Percentages and means could only be calculated for children that had a vaccination card.

3.6 Infant and Young Child Feeding (IYCF) Practices

Breastfeeding is near-universal in this population, with 99.4 percent of children ever breastfed. Furthermore, more than three-quarters of children were put to the breast within one hour of birth (**Table 3.15**). However, only 65.1 percent of children less than 6 months of age were exclusively breastfed in the past 24 hours, and 75.3 percent were predominantly breastfed. At one year of age, 97.5 percent of children were still breastfed, and 77.3 percent at two years of age, reflecting a high rate of continued breastfeeding up to 2 years of age as recommended. The high percentage of continued breastfeeding explains the overall high rate (82.5%) of age-appropriate breastfeeding in children 0 to 23 months of age. Of the children not being breastfed in the past 24 hours (7.6% of children), only 24.5 percent were given at least two milk feedings in the past 24

hours as recommended. Bottle feeding was quite common, with half of all children less than 24 months of age having been fed with a bottle in the past 24 hours.

Some form of complementary food was given to 89.6 percent of children aged 6-8 months. Many of these children were likely to have been given these foods from an earlier age, as indicated by the levels of exclusive and predominant breastfeeding. Only half of the children 6 to 23 months of age (51.7%) consumed iron-rich foods in the previous 24 hours. Meal frequency was appropriate for 73.3 percent of children; a clear downward trend with age is observed for this indicator, however (**Figure 3.3**): close to 91 percent of children 6 to 8 months received the minimum meal frequency, whereas only 66 percent did so among the 18-20 month old group (note that minimum recommended feeding frequency increases from 3 times per day for 6-8 month old children to 4 times among older age groups). The opposite was found for dietary diversity: less than half of the youngest children consumed at least four food groups, but the proportion rose to 70.9 percent for the oldest children. Combining the breastfeeding, meal frequency, and dietary diversity indicators, less than half of children aged 6 to 23 months were given a minimum acceptable diet (42.3%); the percentage of children receiving a minimum acceptable diet improved with age, however, as did dietary diversity and the consumption of iron-rich foods (**Figure 3.3**).

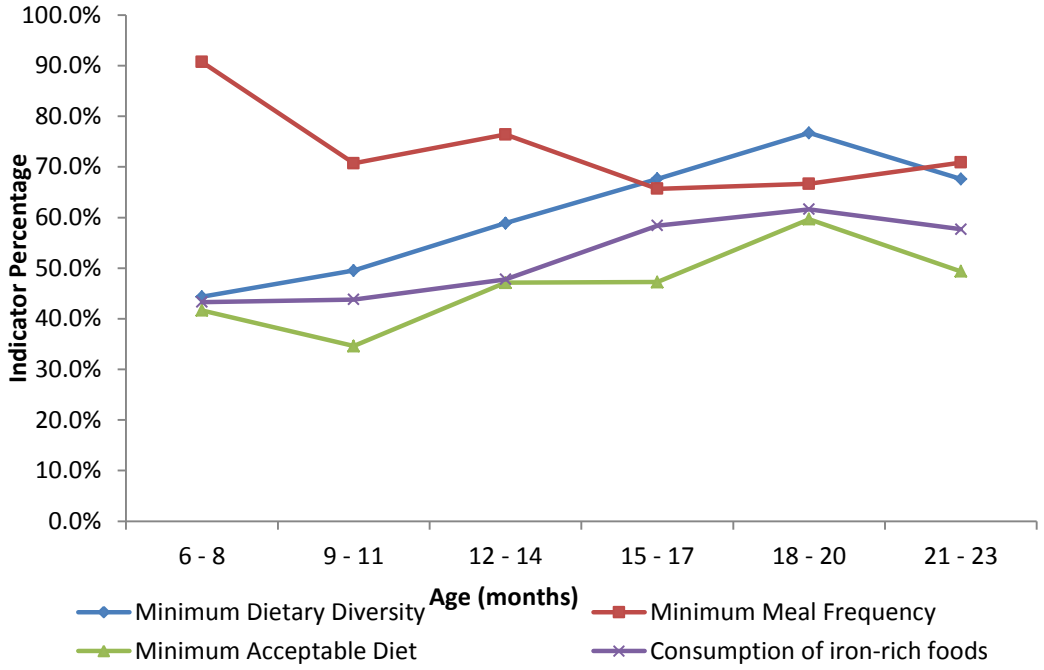
There were no meaningful differences between the strata for any of the IYCF practices indicators.

Table 3.15 Infant and young child feeding practices (IYCF indicators)[a]

	Full sample		Stratum					
			ABC		DE		F	
	N	Percent	N	Percent	N	Percent	N	Percent
Breastfeeding indicators[b]								
Child ever breastfed	725	99.4	258	100.0	238	98.7	229	99.5
Early initiation of breastfeeding (within 1 hour of birth)	719	75.1	258	73.3	234	76.9	227	75.3
Exclusive breastfeeding of children among children < 6 months of age	152	65.1	62	62.9	40	70.0	50	64.0
Predominant breastfeeding among children < 6 months of age	154	75.3	62	70.9	41	80.5	51	76.5
Continued breastfeeding at 1 year (12-15 months)	120	97.5	42	97.6	45	95.6	33	100.0
Continued breastfeeding to 2 years (20-23 months)	128	77.3	47	74.5	29	79.3	52	78.9
Age-appropriate breastfeeding	721	82.5	256	79.7	237	85.7	228	82.5
Bottle feeding	725	49.4	258	45.3	238	52.5	229	50.7
Milk feeding frequency for non-breastfed children (≥ 2 milk feedings/day)	53	24.5	20	25.0	18	33.3	15	13.3
Complementary feeding indicators[b]								
Introduction of solid, semi-solid or soft foods, 6-8 months	96	89.6	32	84.4	40	95.0	24	87.5
Consumption of iron-rich or iron-fortified foods	570	51.7	196	53.6	197	55.3	177	45.8
Minimum meal frequency	551	73.3	186	75.3	193	69.9	172	75.0
Minimum dietary diversity (≥ 4 food groups)	572	60.1	196	55.1	197	67.0	179	58.1
Minimum acceptable diet	570	42.3	196	39.3	197	44.7	177	42.9

[a] Values are percent; bolded numbers mean that there are significant differences between the strata.
[b] Please refer to methods section for definitions of indicators.

Figure 3.3 Complementary feeding, by age group



3.7 Child Health

Approximately 45.8 percent of mothers reported at least one morbidity symptom for their child less than 24 months of age in the two weeks preceding the survey (**Table 3.16**). The most commonly reported symptoms were fever (35.4% of all children); not being able to drink liquids or breast milk (31.9%); coughing (30.0%); and diarrhea (23.7%). Seventeen percent had vomited, 16.8 percent could not eat, and 15.3 percent of children had respiratory problems, such as fast breathing or trouble breathing.[21] On average, children had 1.7 symptoms in the last two weeks.

Table 3.16 Prevalence of morbidity symptoms[a]

	Children 0-23 months of age			
		Stratum		
	Full sample	ABC	DE	F
	N = 726	N = 258	N = 238	N = 230
Fever	35.4	33.3	35.3	37.8
Could not drink	31.9	28.7	34.0	33.5
Cough	30.0	27.5	30.3	32.6
Diarrhea	23.7	20.5	25.6	25.2
Vomiting	17.2	14.3	20.2	17.4
Could not eat	16.8	14.3	19.3	16.9
Respiratory problems	15.3	**13.2**	**15.1**	**17.8**
Number of symptoms	1.7 (2.1)	1.5 (2.0)	1.8 (2.2)	1.8 (2.1)

[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the strata.

Forty-three percent of children with diarrhea were treated with ORS and 83.8 percent continued to receive breast milk, both recommended practices. Less desirable, but common household

[21] Group ABC had a statistically smaller percentage of children with respiratory problems than the other two groups.

treatments for diarrhea were also given to children: *agua de masa*[22] (45.9%) and water (64.5%) (**Table 3.17)**.

Table 3.17 Treatment practices for children with diarrhea[a]

	Children 0-23 months of age with diarrhea			
		Stratum		
	Full sample	ABC	DE	F
	N = 172	N = 53	N = 61	N = 58
Breast milk	83.7	84.9	80.3	86.2
Water	64.5	60.4	65.6	67.2
Agua de masa[b]	45.9	47.2	44.3	46.6
Oral Rehydration Salts (ORS)	43.6	**37.7**	**47.5**	**44.8**
Broth	34.3	33.9	44.3	24.1
Rice water	26.7	30.2	29.5	20.7
Sugar or caffeinated drinks	22.7	22.6	27.9	17.2
Household solution	16.9	15.1	19.7	15.5
Tea	12.2	9.4	19.7	6.9
Yogurt	0.6	0.0	0.0	1.7
Other liquids	4.1	5.6	6.6	0.0
Milk or baby formula	3.5	1.9	3.3	5.2

[a] Values are percent; bolded numbers mean that there are significant differences between the strata.
[b] *Agua de masa* is a drink made from adding tortilla dough to boiling water. *Agua de masa* is a traditional drink prepared for children with diarrhea or individuals that are low in energy.

Almost one-quarter of children had severe diarrhea (23.6%), defined as having diarrhea along with at least one of the following conditions: a fever, having more than six watery stools per day, marked thirst, not eating or drinking well, having blood in the stool, or remaining sick for several days. Close to 7 percent of children had severe respiratory problems (6.6%), defined as having a cough in the past two weeks along with difficulty or fast breathing due to chest problems. Children with a severe illness, defined as having severe diarrhea or severe respiratory problems, should be taken to a health professional immediately; only 29.5 percent of mothers with a child suffering from a severe illness, however, sought medical advice. Receiving medical attention was defined as taking the child to a CC or another healthcare center such as a public hospital or a private clinic, or as giving the child medicine with a prescription.

There were very few statistically significant differences in morbidity symptoms in children between the strata.

3.8 Physiological Status and Anthropometry of Mothers

Almost 11 percent of mothers were pregnant at the time of the interview (**Table 3.18**). Women were very short in stature: the average height of mothers was 146.3 cm, and 39.0 percent of the women were under 145 cm. Short maternal stature is an important determinant of obstructed labor, an important cause of maternal mortality, and is also associated with fetal growth restriction. The average BMI (for non-pregnant women) was 24.8, just within the normal range. Very few women (less than one percent) were underweight. The prevalence of unhealthy weights, however, was very high: 35.8 percent of mothers were overweight, and 6.7 percent were obese.

[22] *Agua de masa* is a drink made from adding tortilla dough to boiling water. Agua de masa is a traditional drink prepared for children with diarrhea or individuals that are low in energy.

There were no meaningful differences between the strata for any of the mothers' physiological status or anthropometry measures.

Table 3.18 Physiological status and anthropometry of mothers[a]

	Caregivers with children 0-59 months of age			
		Stratum		
	Full sample	ABC	DE	F
	N = 1,307	N = 435	N = 437	N = 435
Percent pregnant	10.6	10.6	11.7	9.6
Height (cm)	146.3 (4.7)	146.0 (4.9)	146.9 (4.4)	146.1 (4.6)
Percent less than 145 cm	39.0	42.6	33.6	40.1
Weight (kg)[b]	52.8 (7.7)	52.8 (7.7)	53.2 (7.6)	52.8 (7.8)
BMI [b]	24.8 (3.3)	24.8 (3.2)	24.7 (3.3)	24.7 (3.3)
Percent underweight (BMI < 18.5)[b]	0.7	0.8	0.8	0.3
Percent normal BMI (18.5 ≤ BMI < 25)[b]	56.9	57.1	56.5	57.5
Percent overweight (25 ≤ BMI < 30)[b]	35.8	35.9	36.0	35.4
Percent obese (BMI ≥ 30)[b]	6.7	6.2	6.7	6.9

[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the strata.
[b] Weight and BMI are only reported for women who reported not being pregnant at the time of the interview.

3.9 Child Nutritional Status

The average age of all children surveyed was 29.9 months, and approximately half were boys (**Table 3.19**).

Children in this sample were already quite stunted (HAZ < -2 SD) during their first 6 months of life (prevalence of 24.8%) and their growth continued to falter with age, reaching a prevalence of stunting of 63.4 percent at 18-23 months of age; the prevalence of stunting stabilized at around 66 percent beyond 24 months (**Figure 3.4)**. The overall prevalence of stunting was very high at 56.6 percent for children less than 60 months of age (**Table 3.19)**. Mean height-for-age Z-scores (HAZ) followed a similar pattern, showing a marked deterioration between 6 and 23 months, at which time they stabilized at a low level of -2.3 for children 24-59 months of age (**Figure 3.5**).

Mean weight-for-height Z-score (WHZ) remained above zero throughout infancy and childhood (**Figure 3.5**), although some drop is observed up to the age of 18 to 23 months (**Figure 3.5**). These results are not alarming, however, since wasting (WHZ < -2 SD) was extremely uncommon in the study population, with only one percent of all children wasted and a prevalence of wasting below 2.5 percent at all ages (**Figure 3.4**).

Not surprisingly, the prevalence of underweight (WAZ < -2 SD), which reflects the combination of wasting and stunting, was somewhere in between the two indicators. Prevalence of underweight children was close to 13 percent (Table 3.19). The age trend for weight-for-age Z-scores (WAZ) follows a similar pattern as that of HAZ showing a decline from birth to 23 months of age and stabilizing thereafter (Figure 3.5). The highest prevalence of underweight (over 15%) was found in children 18 to 35 months of age (Figure 3.4).

There were no statistically significant differences in the HAZ, WHZ, or WAZ scores of children between the strata. There were a few statistically significant differences between males and females; females had higher height-for-age, weight-for-age, and weight-for-age scores than males.

Table 3.19 Child nutritional status[a]

	Children 0-59 months of age											
				Stratum								
	Full sample			ABC			DE			F		
	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls
	N = 1,819	N = 896	N = 923	N = 612	N = 305	N = 307	N = 608	N = 297	N = 311	N = 599	N = 294	N = 305
Age (months)	29.9 (16.6)	30.3 (16.6)	29.4 (16.6)	29.5 (16.8)	30.6 (16.8)	28.4 (16.8)	29.8 (16.5)	29.1 (16.4)	30.5 (16.7)	30.3 (16.5)	31.3 (16.7)	29.3 (16.3)
Sex (percent male)	49.3	-	-	49.8	-	-	48.8	-	-	49.1	-	-
Height-for-age Z-score	-2.2 (1.0)	-2.2 (1.0)	-2.1 (1.0)*	-2.2 (1.1)	-2.3 (1.0)	-2.2 (1.1)	-2.1 (0.9)	-2.2 (1.0)	-2.1 (0.9)	-2.1 (1.0)	-2.2 (1.0)	-2.1 (1.0)
Stunted (HAZ < -2 SD)	56.6	58.8	54.4	58.8	62.2	55.4	57.3	58.2	56.4	53.4	55.4	51.4
Weight-for-age Z-score	-1.0 (1.0)	-1.1 (1.0)	-0.9 (1.0)*	-1.1 (0.9)	-1.2 (0.9)	-1.0 (0.9)	-0.9 (0.9)	-1.1 (0.9)	-0.9 (0.9)	-0.9 (0.9)	-0.9 (0.9)	-0.9 (0.9)
Underweight (WAZ < -2 SD)	12.9	14.6	11.2*	15.9	18.2	13.7	11.0	14.5	7.7	11.5	10.9	12.1
Weight-for-height Z-score	0.3 (0.9)	0.3 (1.0)	0.4 (0.9)*	0.3 (0.9)	0.2 (0.9)	0.4 (0.9)	0.3 (0.9)	0.3 (1.1)	0.4 (0.8)	0.4 (0.9)	0.3 (0.9)	0.4 (0.9)
Wasted (WHZ < -2 SD)	1.1	1.6	0.6	0.8	0.9	0.6	1.6	2.7	0.6	0.8	1.0	0.6

Note: * difference between males and females are statistically significant at the 5 percent significance level (two sample t test).
[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the strata.

Figure 3.4 Prevalence of stunting, underweight, and wasting, by age

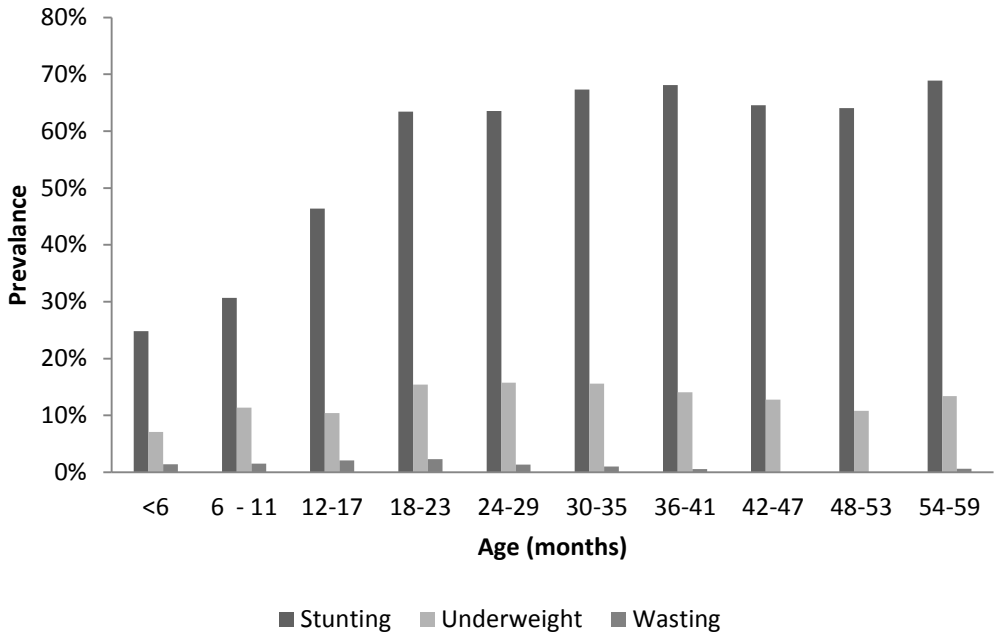
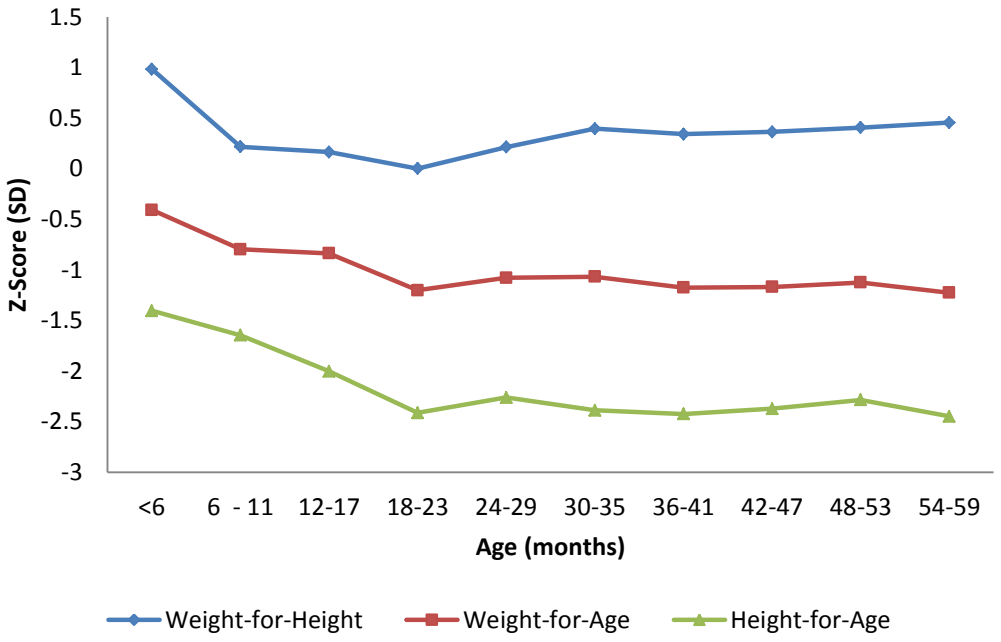


Figure 3.5 Mean Z-scores for height-for-age, weight-for-age, and weight-for-height



4. Discussion

4.1 Summary of Key Findings

Convergence centers and community healthcare infrastructure

Even though CCs and communities appear to have an adequate level of healthcare personnel, their ability to supply quality healthcare services is limited due to a lack of necessary medical equipment and supplies and the limited knowledge of the health staff. All of the surveyed CCs had a scale to monitor child weight, but few had length/height boards to monitor height. Furthermore, most CCs did not have the ten essential medications. Health staff demonstrated an acceptable level of knowledge on topics related to breastfeeding and the introduction of complementary foods. However, basic hygiene knowledge was lacking and while they knew more danger signs than mothers did, they still could only mention two danger signs for sick children and three for pregnant women.

Household characteristics

The families surveyed live in small houses of poor quality without access to basic services such as water and electricity. Surprisingly, no household reported that they had experienced severe hunger and only few had experienced moderate hunger. The quality of the household diet, however, was poor. Households predominantly consumed staple cereals, oils, and sugar, with some beans and eggs. Less than half of households consumed meat. The consumption of fruits, dairy, vegetables, or fish was rare.

Characteristics and knowledge of mothers

Mothers were of Mayan ethnicity. Two-thirds were illiterate and did not speak Spanish. Knowledge of correct breastfeeding practices was high, but only half of mothers could identify the correct age for the introduction of complementary foods. As discussed below, the caregivers' knowledge did not correspond to actual practices. Few mothers knew the danger signs of pregnancy or the danger signs of childhood illness.

Preventive healthcare seeking

Most women attended a sufficient number of prenatal visits, and the majority of them received the expected services (e.g., tetanus shots and blood pressure measurement). While most CCs did not have the necessary equipment to provide the required prenatal services (see Table 3.1), these medical supplies are supposedly brought by the nurse or doctor at their monthly CC visits or are owned by the midwife. The survey did not verify whether this was the case, however. Notwithstanding the popularity of prenatal care, two-thirds of women delivered at home (65%). Close to 90 percent of all deliveries, however, were attended by a trained health professional, which probably explains the high proportion of newborns having received essential newborn care. Postnatal care appears to be inadequate as less than a quarter of newborns were attended by a doctor or a nurse and less than 20 percent saw a CC-approved midwife.

Attending growth monitoring and promotion in children 12 to 23 months was near universal. On average, children attended a little over half the number of the visits recommended by the MSPAS. Although the majority of children attended at least some of their recommended preventive health visits, many children were not fully immunized nor received all of the recommended micronutrient supplements. Less than half of children had received a mega-dose

of vitamin A in the past six months and only about half received iron and folic acid or *Chispitas*. Another potential problem is that some children received both *Chispitas* and iron and folic acid supplements. It is unclear if these were distributed simultaneously to these children or at different time points. Use of different supplements in the same household could lead to confusion and possible improper use, and, if given at the same time, for a prolonged period of time, could lead to problems of toxicity, especially in terms of iron use. About one-third of children 18 to 23 months of age were not fully immunized. Our results further indicate that vaccinations were often received later than recommended, potentially reducing their effectiveness in preventing disease.

Infant and young child feeding practices

Breastfeeding is universal in this population, but early introduction of liquids and foods is a concern. Early introduction of liquids puts children at increased risk of food- and water-borne infections and may displace breast milk, thereby reducing nutrient intake from breast milk. Widespread use of bottle feeding also puts children at further risk of disease, as proper hygiene or sterilization is likely to be unavailable.

On the knowledge test, approximately one-half of the mothers reported correctly that children should start receiving liquids and semi-solid foods at 6 months. When asked about their practices, however, many mothers reported introducing foods and liquids other than breast milk much earlier than 6 months. Early introduction of inappropriate foods along with poor food hygiene, poor water quality and sanitation can lead to poor nutritional status and morbidity, the combination of which likely contributes to the high rates of stunting and diarrhea in this population. On the other hand, over 10 percent of children had not been given complementary foods until after 6 months of age, which can have negative implications for nutrient intake, since breast milk is no longer sufficient from 6 months onward.

Frequency of feeding was also inadequate in many children, and this became worse as children grew older and the recommended number of feedings increases. Dietary diversity and the consumption of iron-rich foods, however, improved with age, probably as children gradually move toward consuming the family diet. Overall, however, only 60 percent of our sample of children under 2 years of age consumed four or more food groups and 52 percent consumed iron-rich (or iron-fortified) foods in the previous 24 hours.

In summary, while breastfeeding is nearly universal and continued well into the second year of the child's life, exclusive breastfeeding for the first 6 months and the low quality and frequency of complementary feeding constitute a major problem.

Anthropometry of the mother

The high average BMI (24.8) and the high prevalence of overweight and obesity (40%) among mothers are alarming. This finding is consistent with the low prevalence of hunger and the poor quality diet lacking diversity. The high prevalence of overweight and obesity in this population is of particular concern in the context of the PROCOMIDA program, which provides households with family food rations including oil, rice, and beans. The high prevalence of overweight and obesity was unknown to the program when the BCC was designed. PROCOMIDA may thus have to consider adding a BCC module on healthy eating, dietary diversity, balanced diets, and how to prevent overweight and obesity.

Child nutrition and health status

Almost half of children had been ill in the preceding two weeks according to mother reports, mainly with fever, lack of appetite, cough, and diarrhea. Only half of the children with diarrhea were treated with ORS. Of the 30 percent of children who had a potentially severe illness in the previous two weeks, less than one-third received medical attention as is recommended. The high levels of morbidity and the inadequate care-seeking behaviors are in line with the poor housing and sanitation condition of most households, the limited knowledge of caregivers regarding the prevention of illness, the identification of danger signs, and the appropriate feeding of children during illnesses.

As documented previously in Guatemala, stunting was found to be a major problem. Child growth followed the pattern seen in most developing countries: growth faltering starts in the first few months of life (even in populations where birth weight is largely normal) and intensifies gradually throughout the first two years to reach a plateau at the ages of two to three years (Ruel 2001; Victora et al. 2010). As has been observed in other countries, the prevalence of stunting was significantly higher in boys than in girls. This is thought to be due to boys being biologically weaker and thus more prone to suffering from the negative impact of adverse environments than girls (Wamani et.al 2007).

There was no wasting in this population and the prevalence of underweight was at moderate levels, with the majority of underweight likely to be explained by the high levels of stunting, whereby a short child would likely weigh less for his age than expected.

The overall picture of child growth (high levels of child stunting and the absence of wasting) is in line with the other findings of this study. Household hunger was found to be uncommon, indicating that household dietary energy deficiency does not constitute a major problem. The quality of the household and child diet, however, was found to be low. As a consequence, children may lack some essential micronutrients, which result in growth faltering. Maternal short stature (39% < 145 cm) is also likely to be associated with growth retardation *in utero.* Another important factor that most likely contributes to the children's short stature are repeated bouts of illness.

Differences between strata

While some differences were found between the strata, it was well within the bounds that would be expected with multiple comparisons. Furthermore, there were no systematically consistent differences between the strata, indicating that the strata were comparable.

4.2. Recommendations

Based on the findings of the baseline study, we provide the following recommendations to improve the health and nutrition of the population targeted by PROCOMIDA in Guatemala. Some of these recommendations fall within the scope of activities PROCOMIDA proposed to do as part of the implementation of the PM2A program. Others, however, are beyond the scope of what can be addressed by the program.

Health system

Strengthening the provision and quality of healthcare requires a better supply of basic medical equipment, supplies, and medicine. The basic health knowledge of the staff needs to be improved through retraining of current staff and better pre-service training of new personnel. One area of training should be the correct type of timing of micronutrient supplements. In the research arms implementing LNS and MNPs health staff will receive training on the correct use of these supplements. Staff should also be trained on adult education didactics to ensure that knowledge is effectively transferred to the beneficiary population.

Our findings indicate that care-seeking for postnatal care, for preventive child healthcare (including immunizations), and for (severe) childhood illness was deficient. Our data do not allow us to determine to what extent characteristics of the health sector are responsible for this limited demand. Ensuring a reliable supply of medicines and vaccines and removing language and cultural barriers between the Q'eqchi'-speaking population and Spanish-speaking health professionals should lead to a more adequate utilization of health services.

Household diet

The high prevalence of overweight and obesity among women (combined with the absence of wasting in children) in the Alta Verapaz region indicates that household dietary energy deficiency does not constitute a problem. The low prevalence of hunger provides further evidence in this direction. If not properly used, the foods provided by the PROCOMIDA program will contribute to a further rise in unhealthy weights. To prevent this from happening, the PROCOMIDA BCC campaign should actively promote the adequate use of the family ration. Beneficiary households should consider the family ration as a means to relieve household budget constraints (freeing up resources that can be used to buy high quality, nutrient-dense diets) rather than a supply of additional calories that will be simply added to the household diet.

Mother health and IYCF practices

Our results confirm that a major emphasis of the PROCOMIDA BCC strategy should be not only on improving the caregivers' knowledge of health and child-feeding practices, but more important on promoting the adoption of recommended practices. Messages promoting better practices also need to be accompanied by support to caregivers and their families to facilitate putting the improved knowledge into practice.

In addition to improving caregiver knowledge, better household dietary diversity could contribute to better quality diets for children as well. As indicated above, households should be encouraged to use the family ration as a supply of additional resources, allowing them to improve the quality of the household diet. In addition to the beneficial effect on child dietary intake, this would also contribute to better nutritional status of other household members.

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Appendix A: Indicator Performance Tracking Table (IPTT) Indicators

The IPTT indicators required by FFP as part of Mercy Corps' contractual requirements are presented in Table A.1 and A.2.

Table A.1: Household Indicator Performance Tracking Table (IPTT) Indicators

Indicator	Indicator Definition	Variables to be collected/instrument	Sample[a]	Baseline values
CHILD				
% children 6-59.9 mo underweight (<-2 Z score W/A)	(children 6-59.9 mo with weight-for-age Z-score < -2 SD/all children 6-59.9 mo)*100	• Weight • Age • Sex	All children 0-59.9 months	13.3%
% children 6-59.9 mo stunted (<-2 Z score H/A)	(children 6-59.9 mo with height-for-age Z-score < -2 SD/all children 6-59.9 mo)*100	• Height • Age • Sex	All children 0-59.9 months	59.2%
% of children 0 – 6 mo of age exclusively breastfed	(Infants 0–5.9 mo of age who received only breast milk during the previous day/all infants 0–5.9 mo of age)*100	• Infant received exclusive breastfeeding in the past 24 hrs, i.e. infant received breast milk (including expressed breast milk or breast milk from a wet nurse) and potentially ORS, drops, syrups (vitamins, minerals, medicines), but nothing else.	All children 0-23.9 mo	65.1%
% children 6-23.9mo of minimum dietary diversity	(Children 6–23.9 mo of age who receive foods from 4 or more food groups/all children 6–23.9 mo of age)*100	Food groups to be measured: • grains, roots and tubers • legumes and nuts • dairy products (milk, yogurt, cheese) • flesh foods (meat, fish, poultry and liver/organ meats) • eggs • vitamin-A rich fruits and vegetables • other fruits and vegetables	All children 0-23.9 mo	60.1%
% of children being (breast)fed properly	(Children 0–23.9 mo of age (breast)fed properly/all children 0–23.9 mo of age)*100	• See the WHO Infant and Young Child Feeding (IYCF) indicators for details (WHO 2008)	All children 0-23.9 mo	82.5%
% deliveries at health facilities	(deliveries in the last 12 mo taking place at health post or health center/all deliveries in past 12 mo)*100	• Place of delivery	All children 0-11.9 mo	35.9%
% of newborns who receive essential newborn care	Composite indicator: 3 sub-indicators: • (Children born in the last 23.9 mo who were put to the breast within 1 hour of birth)/all children born in the last 23.9 mo)*100 • (Children born in the last 23.9 mo who were dried (wiped) immediately after birth before the placenta was delivered)/all children born in the last 23.9 mo)*100 • (Children born in the last 23.9 mo who were wrapped in a warm cloth or blanket immediately after birth before the placenta was delivered)/all children born in the last 23.9 mo)*100	• Child breastfed within 1 hr of birth • Child dried (wiped) immediately after birth before the placenta was delivered. • Child wrapped in a warm cloth or blanket immediately after birth before the placenta was delivered?	All children 0-23.9 mo	• 75.0% • 98.8% • 99.0% **(MJ) Minimum number???**

Indicator	Indicator Definition	Variables to be collected/instrument	Sample[a]	Baseline values

% children aged 0-59.9 mo with diarrhea who received adequate treatment	Composite indicator:
	• (Children 0-23.9 mo of age with severe diarrhea[1] who were taken to trained provider/all children 0-23.9 mo of age with severe diarrhea)*100
	• (Children 0-23.9 mo of age with diarrhea who were given ORS/all children 0–23.9 mo of age with diarrhea)*100
	
	[1] Definition: diarrhea AND (fever OR many watery stools (> 6) OR repeated vomiting OR marked thirst OR not eating/drinking well OR blood in the stool OR not getting better/getting sicker/very sick).
		• Child had diarrhea in past 2 weeks
		• Blood in stool
		• Number of stools/day at maximum
		• Fever
		• Repeated vomiting
		• Marked thirst
		• Not eating/drinking well
		• Not getting better/getting sicker/very sick
		• Action taken when child had diarrhea:
		  ○ Given ORS
		  ○ Taken to health provider
			All children 0-23.9 mo	• 26.3%
				• 43.6%

% children aged 6 – 59.9 months with respiratory diseases that received adequate treatment	(Children 6–23.9 mo of age with potential pneumonia[1] who were taken to trained provider/all children 6–23.9 mo of age with potential pneumonia)*100 [1] Definition: illness with cough in the past 2 wk AND (difficulty or fast breathing due to chest problem	• Illness with cough in the past 2 wk • Difficulty breathing • Fast breathing • Difficulty breathing due to a problem in the chest	All children 0-23.9 mo	40.5%
% of births attended by a doctor, nurse or trained midwife	(deliveries in the last 12 mo assisted by doctor, nurse or by trained (auxiliary) midwife/all deliveries in past 12 mo)*100	• Who assisted with the delivery	All children 0-11.9 mo	• Midwife: 50.9% • Medical staff: 36.3%
% children receiving full vaccinations	(children aged 12 to 23.9 mo fully vaccinated[1]/all children 12 to 23.9 mo of age)*100 [1]Definition: per National Protocols	• Vaccinations received	All children 0-23.9 mo	85.9%
% children receiving routine health services	(children aged 0 to 23.9 mo regularly attending health check-ups[1]/all children 0 to 23.9 mo of age)*100 [1]Definition: needs to be defined	• Number of health checks • Age of the child	All children 0-23.9 mo	• Average number of health check-ups, 6.6(3.5) • Regularly attending, Number of visits>=age in months, 18.3%
MOTHERS				
Change in nutritional knowledge of caregivers of children 0 to 23.9 mo of age	(nutrition knowledge[1] at endline of mothers with children 0 to 23.9 mo of age/nutrition knowledge at baseline of mothers with children 0 to 23.9 mo of age)*100 [1] Definition: to be defined based on BCC development	• Nutrition knowledge	All children 0-23.9 mo	*Exact definition of indicator to be defined by PROCOMIDA*
% mothers who know when a child should be taken to trained provider for childhood illness	(Mothers with children 0 to 23.9 mo of age who can list 3 danger signs when child needs to be taken to a trained provider/all mothers with children 0 to 23.9 mo of age)*100	When should a child be taken to a trained provider? • Child not able to drink or breastfeed • Child becomes sicker • Child develops a fever • Child has fast breathing • Child has difficulty breathing • Child has blood in the stool • Child is drinking poorly	All children 0-23.9 mo	4.9%

Indicator	Indicator Definition	Variables to be collected/instrument	Sample[a]	Baseline values
% mothers who know the danger signs of pregnancy	(Mothers with children 0 to 23.9 mo of age who can identify at least 4 danger signs and corrective actions during pregnancy/all mothers with children 0 to 23.9 mo of age)*100	How many of the following danger signs can the mother list: • Vaginal Bleeding • Pelvic or Abdominal Pain • Persistent Back Pain • Gush of Fluid from Vagina • Swelling of the Hands/Face • Severe Headaches, Blurry Vision • Regular Contractions prior to 37 Weeks • No Fetal Movement	All children 0-23.9 mo	5.9%
% mothers receiving minimum recommended antenatal care	(Mothers of children born in the last 12 mo who were seen at antenatal clinic (ANC) at least 4 times during pregnancy /mothers of all children born in the last 12 mo)*100	• Number of prenatal ANC visits during pregnancy • Did pregnant mother receive: o Vacuna Toxoide Tétano o Suplemento c/ hierro, ácido fólico, o Toma de presión arterial o Consejería (PF).	All children 0-11.9 mo	82.2%
% mothers receiving minimum recommended post natal care	(Mothers of children born in the last 12 mo who received postnatal care within 3 days of birth/mothers of all children born in the last 12 mo)*100	• Number of days from birth to first postpartum care visit.	All children 0-11.9 mo	26.9%
% mothers overweight or obese	(mothers of children 0-59.9 mo with BMI > 25 (or 30)/all mothers of children 0-59.9 mo)*100	• Weight • Height • Age	All mothers of children 0-59.9 months	42.4%
HOUSEHOLD				
% of change in Household dietary diversity score (HDDS)	(Endline HDDS/Baseline HDDS)*100	In the past 23.9 hours, did the HH consume any of the following food groups: • A. Cereals • B. Root and tubers • C. Vegetables • D. Fruits • E. Meat, poultry, offal • F. Eggs • G. Fish and seafood • H. Pulses/legumes/nuts • I. Milk and milk products • J. Oil/fats • K. Sugar/honey • L. Miscellaneous	All households with children 0-59.9 mo	5.8%
% Households with household actions plans	(households with children 0 to 59.9 mo of age who have developed a household action plan[1]/all households with children 0 to 59.9 mo of age)*100 [1]Definition: Household Action Plan refers a household's preparation to take care and prevent health problems.	• The variables to be collected and the measurement of the composite index are under construction.	All households with children 0-59.9 mo	1.8%
% food insecure households	(households with children 0 to 59.9 mo of age who are food insecure/all households with children 0 to 59.9 mo of age)*100	• FANTA Household Hunger Scale (HHS)	All households with children 0-59.9 mo	91.2%

[a] In some cases the data collected are in a wider age range than what are needed to calculate the indicators. Reasons for this are to ease data collection and because it may be of interest for future analysis to have this info.

Table A.2: Community Indicator Performance Tracking Table (IPTT) Indicators

Indicator	Indicator Definition	Variables to be collected/instrument	Sample	Baseline value
% health facility staff and community volunteers able to identify minimum number of core health and nutrition practices	(health facility staff and community volunteers able to identify minimum number of core health and nutrition practices[1])/(all health staff and community volunteers)*100; [1]Definition: specific practices to be identified by MC as part of BCC development	• Core health and nutrition practices health staff can list.	Community Center Facilitator and Community Center Auxiliary Nurse	*Exact definition of indicator to be defined by PROCOMIDA*
% health facilities meeting minimum standards for health and nutrition services and practices	Composite indicator: • (health facilities[1] with staff meeting minimum knowledge on health and nutrition services and practices[2]/all health facilities)*100 • (health facilities[1] providing minimal services[3]/all health facilities)*100 [1]Definition: MC to define which levels will be included (Convergence Center (CC), health post and health center level) [2]Definition: Quality of service will be assessed through examination of a finite number of case examples. [3]Definition: Availability of minimum services as defined by the MoH	• List of prenatal and post-natal services provided to women • List of services provided to children less than five years of age.	Convergence Center	*Exact definition of indicator to be defined by PROCOMIDA*
Availability of a minimal level of infrastructure, supplies, and medications at health facilities	Composite indicator: • (health facilities having minimal required infrastructure[1]/all health facilities)*100 • (health facilities having minimal required supplies and medication[2]/all health facilities)*100 [1]Definition: A list of minimum infrastructure provided by MoH will be used to measure this indicator. [2]Definition: A list of minimum supplies and medication provided by MoH will be used to measure this indicator.	• Convergence Centers with list of basic medicines and vaccines. • List of basic medical equipment in the convergence centers	Convergence centers	*Exact definition of indicator to be defined by PROCOMIDA*
% of local community health volunteers who meet minimum standards/ threshold for performance	(health volunteers meeting minimum performance standards[1]/all health volunteers)*100 [1]Definition: existence of training, supervision, support and community feedback on care. MoH tools for evaluation *Sistema Integral de Atencion en Salud* (SIAS) will be used.	• Training received by health care workers in last twelve months • Education level of community health workers	Convergence centers	*Exact definition of indicator to be defined by PROCOMIDA*

Appendix B: Ration Sizes

The family ration will include rice, beans, and oil; assuming an average household size of 6.88 people, the family ration will provide an average of 445 kcal per capita per day. The individual ration will include corn-soy blend (CSB) targeted to either the mother or the child of the participating family. The CSB is intended to be used strictly by the targeted individual, and if so, will provide an average of 494 kcal per day **(Table B.1)**. Rice and beans were chosen for the family ration because they are two of the primary staple foods in Guatemala; it is expected that provision of these food items will help prevent the sharing of the CSB with other household members. One study arm will receive a reduced family ration, which is included in **Table B.2**.

Table B.1: Monthly ration size PROCOMIDA

Target group	CSB (kg)	Rice (kg)	Pinto beans (kg)	Vegetable oil (kg)	Energy/month (kcal)	Energy/day[a] (kcal)	Energy/ capita/day[b] (kcal)
Individual[c]	4.0				15,028	494	-*
Family		12.0	6.0	3.7	93,084	3,060	**445**
Total ration	**4.0**	**12.0**	**6.0**	**3.7**	**108,112**	**3,554**	**-***

Notes: * Note that the individual ration is not meant to be shared, so we do not include it in the computation of total energy/capita/day. If it was shared, it would provide an additional 71 kcal/day/capita, and the total food ration would therefore provide 516 kcal/day/capita.
[a] Energy per day: using 30.42 days/month.
[b] Per capita energy is based on the assumption of 6.88 average family size.
[c] Pregnant/lactating woman or child 6-24 months.

Table B.2: Ration sizes: Full monthly family ration and reduced family ration

	Full family ration		Reduced family ration	
Foods	**Weight (kg)**	**Energy (kcal)**	**Weight (kg)**	**Energy (kcal)**
Rice	12.0	43,800	7.0	25,550
Pinto beans	6.0	20,400	3.0	10,200
Vegetable oil	3.7	28,884	1.84	14,364
Total	**21.7**	**93,084**	**11.84**	**50,114**
Total kcal/capita/day[a]		**445**		**239**

[a] Total kcal/capita/day is derived using an average household size of 6.88 members and 30.42 days/month.

Appendix C: List of Correct Responses to Knowledge Questions

Table C.1 presents correct responses to knowledge questions presented in Tables 3.3, 3.9, and 3.10.

Table C.1: Correct responses to knowledge questions

Child Feeding and Care Practice Questions	Correct Responses
How soon after being born should a child be breastfed?	Immediately or less than an hour after birth.
What should be done with colostrum?	The colostrums should be given to the child.
When should liquids, besides breast milk, be given to a child?	At 6 months of age.
Should a child less than 6 months of age be given liquids, other than breast milk?	No.
At which age should a baby receive semi-solid foods?	At 6 months of age.
How often should a sick child be fed?	The sick child should receive more food than normal.
How often should a sick child receive liquids?	The sick child should receive more liquids than normal.
How often should a child recovering from an illness be fed?	The convalescence child should receive more food than normal.