Helen Keller International's Enhanced-Home Food Production Program in Burkina Faso

Baseline Report

PRELIMINARY VERSION

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ACRONYMS

BCC	Behavior Change Communication
HAZ	Height-for-Age Z-score
HHS	Household Hunger Scale
IFPRI	International Food Policy Research Institute
IMCI	Integrated Management of Childhood Illness
IYCF	Infant and Young Child Feeding
ORS	Oral rehydration salts
SD	Standard Deviation
WAZ	Weight-for-Age Z-score
WHO	World Health Organization
WHZ	Weight-for-Height Z-score

Table of Contents

List of Tables

List of Maps and Figures

EXECUTIVE SUMMARY

Children's malnutrition is a major cause for concern as malnutrition leads to child mortality and surving children who were severely malnourished when young suffer from reduced cognitive functioning as adults. A recent national survey, the Enquête Nationale sur l'Insécurité Alimentaire et la Malnutrition (ENIAM) found that nearly half of children 12-23 months of age (45%) were stunted (height-for-age Z-score (HAZ) < -2), 32% were underweight (weight-for-age Z-score (WAZ) < -2) and 16% were wasted (weight-for-height Z-score (WHZ) < -2) (ENIAM 2009).

To address the nutritional problems of children in Burkina Faso, Helen Keller International (HKI) has adapted its homestead food production (HFP) program which it has implemented in Asia for the past 20 years. These programs target women and are designed to improve maternal and child health and nutrition outcomes through three primary pathways: 1. Increasing the availability of micronutrient-rich foods through increased food production by women; 2. Income generation through the sale of surplus production; and 3. Increased knowledge and adoption of optimal nutrition practices, including the consumption of micronutrient-rich foods. Increased consumption, along with improvements in health and nutrition related knowledge, and increased income, could all contribute to improvements in maternal and child health and nutrition outcomes.

This baseline report provides documentation about the randomized impact evaluation that was designed by IFPRI to evaluate the E-HFP program in Burkina Faso. A brief description of the project in this report illustrates the importance of the randomized design evaluation strategy to measure the project's impact while controlling for various sources of confounding factors. The report also describes the methodology used to construct the baseline sample and the questionnaire design. The last sections of the report provide descriptive statistics about the villages, households, and the mothers and children of the baseline report.

The information generated by the baseline survey is striking. The patterns of growth faltering seen in this population are similar to those seen in other populations at-risk for nutritional deficiencies (Victora 2010). In this population, the growth faltering began as early as 3 months of age with increasing deficits in HAZ, WAZ, and WHZ seen with increasing age. The prevalence of wasting is extremely high in this population compared to populations from other developing countries. However, the prevalence is similar to that reported in other surveys conducted in Burkina among rural populations with low levels of education which is a similar to the population included in this study. The greater deficit of growth faltering among boys compared to girls is striking. Among children less than 6 months of age are already apparent with 13% of children either stunted or underweight or both and 15% wasted and among children 6-11 months of age the deficits in growth become even more apparent with 24% of children stunted, 27% underweight and 19% wasted.

Although anemia is common in populations where malaria is endemic and where access to high quality foods, especially animal source foods, is limited, the near universal prevalence of anemia among children 3-12 months of age and the relatively high prevalence of severe anemia among the children included in this sample is also alarming. These high rates are likely due to a

combination of illness, lack of access to adequate health care and inadequate access to high quality foods.

Caregiver knowledge related to optimal IYCF and care practices was limited among the participants in the baseline study. Although the majority of caregivers knew that children should be given colostrum, less than a quarter of the participants did not think that a caregiver should give liquids other than breast milk to children less than 6 months of age. In addition, caregivers stated on average that children should start receiving liquids at about 3 months of age as opposed to the recommended 6 months of age and should begin receiving foods on at 7 months of age on average, where again the recommendation is for 6 months of age.

The results from the IYCF practices are alarming – especially in terms of complementary feeding practices. Although breastfeeding is near universal, only 21% of children less than 6 months of age were exclusively breastfed in the previous 24 hours. In addition, among children older than 6 months of age there appears to be a heavy reliance on breast milk and other liquids which do not provide a sufficient amount of energy or nutrients to children during this critical developmental stage.

The vast majority of caregivers included in the baseline survey did not practice optimal complementary feeding practices. The results indicated that in general complementary foods are not introduced until after 6 months of age and once introduced the variety of foods and micronutrient-rich foods consumed appears to be very limited. Children in these villages are a high risk for becoming malnourished and remaining malnourished by their feeding practices alone. The low prevalence of exclusive breastfeeding coupled with the late introduction of complementary foods and heavy reliance on breast milk and other liquids for children over 6 months of age places these children at a very high risk of becoming malnourished.

With respect to agricultural production, the primary livelihood found in our baseline population, constraints with respect to water availability, especially during the secondary agricultural season, and input utilization were frequent. These constraints severely limit the production potential of households and constrain both the food availability and dietary diversity of households.

The baseline report is organized in five sections. The introduction provides motivation and context for a interest in linking agriculture, health and nutrition interventions to reduce child malnutrition. The second chapter provides a brief program description and the intended impacts of the E-HFP. The third chapter describes the methods used to design the impact evaluation strategy, the questionnaire design for the baseline survey and the sampling strategy used to select interviewed households. The fourth and fifth chapter provides the results of the baseline survey and a discussion of these results respectively.

1. Introduction

Children's malnutrition is a major cause for concern as malnutrition leads to child mortality and surviving children who were severely malnourished when young suffer from reduced cognitive functioning as adults. A recent national survey, the Enquête Nationale sur l'Insécurité Alimentaire et la Malnutrition (ENIAM) found that nearly half of children 12-23 months of age (45%) were stunted (height-for-age Z-score (HAZ) < -2), 32% were underweight (weight-for-age Z-score (WAZ) < -2) and 16% were wasted (weight-for-height Z-score (WHZ) < -2) (ENIAM 2009). The underlying factors contributing to growth faltering can be classified into three main categories 1) food, 2) health and 3) care (UNICEF 1990). Deficits in any of these three main categories can lead to growth faltering among children 0-23 months of age.

Access to food and especially to high quality foods is limited despite the fact that households in Burkina are primarily rural agricultural producers. Fluctuations in food availability is tied to the agricultural cycle. The harvest season generally falls between October and April and a hungry season that falls between May/June and September (Frongillo 2006, Savy 2006). The hungry season is marked by a fall in cereal stores, which compose the main staple foods in this population. This fall in cereal stores can lead to deficiencies in energy intake. However, one study conducted in Burkina Faso reported that some households take compensatory measures during this time in which they increase their intake of free or cheap food sources of food such as legumes, fruits, vegetables or milk (Savy 2006). These compensatory measures may contribute to an increase in dietary diversity but not necessarily in energy intake as indicated by the simultaneous increase in dietary diversity scores and prevalence of underweight among women from April to September found in a study conducted by Savy (2006). In addition to seasonal issues, access to sufficient amounts of food as well as to sufficient amounts of nutrient-rich foods are often limited by available inputs and water availability on household farms.

Aside from access to food, optimal infant and young child feeding (IYCF) and care practices (e.g. breastfeeding and complementary feeding practices) play an important role in the survival, growth and development of young children (Black 2008, Bhutta 2008). Recent studies conducted in Burkina Faso have found that the prevalence of exclusive breastfeeding is very low (~6%), complementary foods are generally introduced later than at the recommended age of 6 months (ENIAM 2009) and that the diversity of children's diets is also low (ENIAM 2009, Sawadogo 2006). These suboptimal practices along with other individual (e.g. morbidity) and household level (e.g. income) factors can all contribute to the deficits in children's growth found in Burkina Faso. In the ENIAM study mentioned above, suboptimal IYCF and care practices along with morbidity as well as some other factors were all associated with a higher probability of being wasted or stunted (ENIAM 2009).

As a way to address the nutritional problems of children in Burkina Faso, Helen Keller International (HKI) has adapted its homestead food production (HFP) program which it has been implementing programs in Asia for the past 20 years and has recently begun implementing HFP programs in Africa as well. In general these programs target women and are designed to improve maternal and child health and nutrition outcomes through three primary pathways: 1. Increasing the availability of micronutrient-rich foods through increased food production by women; 2. Income generation through the sale of surplus production; and 3. Increased knowledge and

adoption of optimal nutrition practices, including the consumption of micronutrient-rich foods. Increased consumption, along with improvements in health and nutrition related knowledge, and increased income, could all contribute to improvements in maternal and child health and nutrition outcomes. A large body of literature investigates the effects of targeting women to induce changes in women's outcomes. Both Thomas (1994) and Hoddinott and Haddad (1995) find that increased resources in women's control induce better children's health outcomes and health expenditures. From a theoretical perspective, both Thomas (1990) and Duflo and Udry (2004) have argued that spouses often have separate accounts and provided some framework for understanding the intrahousehold bargaining process and allocation of resources which are central to the E-HFP's strategy to target women. However, Doepke and Tertilt (2011) provide examples where targeting women may not always have large effects on children. Therefore, this research provides an important validation of the gender targeting approach followed by E-HFP.

Evaluations of HFP programs have demonstrated significant increases in household production and consumption of micronutrient-rich foods, though the evaluation strategy to evaluate these programs has varied. These evaluations have primarily been focused in HKI's Asia programs where water constraints are less pronounced then in the West African context. Dillon (2011) provides some evidence that, if water constraints can be reduced through irrigation, large gains in both agricultural production and consumption have been realized by Malian farmers. However, the evidence base on the health and nutrition impacts of these types of programs have been limited (World Bank 2007). To date there has been limited understanding as to how these types of programs can be optimized to maximize impacts on these outcomes. One component that has been identified for strengthening is the behavior change communication (BCC) strategy. Therefore, to try and increase the impact of this type of program on children's health and nutrition outcomes HKI has included a stronger BCC strategy as part of their program design for their enhanced-HFP (E-HFP) program being implemented in Burkina Faso. In addition to this programming change, HKI has also partnered with the International Food Policy Research Institute (IFPRI) to evaluate the E-HFP program in order to better understand the potential of these types of programs to improve maternal and child health and nutrition outcomes and how this impact may be achieved using a rigourous randomized control design evaluation strategy.

IFPRI is leading the overall impact evaluation which will be based on a baseline survey that was conducted in March-April 2010 and a final survey that will be conducted in March-April 2012. This evaluation will examine questions related to the impact of the HFP program on production and consumption outcomes, maternal and child care, health and nutrition related knowledge and practices, and child growth and anemia. This report describes the findings from the baseline survey carried out in Fada N'Gourma, Burkina Faso that was conducted as the first part of the impact evaluation for HKI's E-HFP program.

2. Background Information

2.1 Program Description

The E-HFP program designed by HKI is being implemented in the area of Fada N'Gourma in the eastern region of Burkina Faso. The program has two primary components: an agricultural component and a BCC strategy. The combination of these two primary components are expected to work in an additive or synergistic fashion to improve maternal and child health and nutrition outcomes by providing increased access to micronutrient-rich foods, increasing income through the sale of surplus goods and through the provision of health and nutrition related education designed to elicit positive behavior changes.

Through the agricultural component HKI provides agriculture inputs and training to establish village model farms (VMFs) that are being cared for by four village farm leaders (VFLs). The goal of the VMFs is to grow a variety of micronutrient-rich foods year-round as well as to raise small animals such as chickens and/or goats. In addition to producing micronutrient-rich foods, the VMFs will serve as training sites for participating women to learn best practices in homestead food production such as the use of raised beds, compost, natural pest control methods, the importance of vaccinations for poultry, among others. The participating women, in turn are provided with agriculture inputs and encouraged to establish their own home gardens and small animal production following the practices learned at the VMFs.

The BCC strategy has been developed using the Essential Nutrition Action (ENA) framework. This framework focuses on improving health and nutrition-related knowledge with a specific emphasis on encouraging the consumption of micronutrient-rich foods by women and young children. The BCC strategy is also using the negotiating for behavior change approach which is designed to further encourage participants to implement and adhere to optimal practices such as the increased consumption of micronutrient-rich foods and to help them find ways to overcome any barriers that may be preventing them from adopting and adhering to these best practices. The BCC strategy will be implemented by two distinct groups – a "village committee" group consisting of male and female village members; and an "older women" group comprised of older influential women from the villages. The impact of delivering the BCC strategy through these two groups of actors will be assessed as part of the impact evaluation.

2.2 Intended impacts and pathways of impact

The primary goal of the E-HFP program being implemented in Burkina Faso is to improve the health and nutritional status of children 3-12 months of age at baseline whose households participate in the program. The primary outcomes that are being used to assess this are the prevalence of stunting and height-for-age Z-scores (HAZ). It is expected that children 3-12 months of age at baseline who participated in the program will have a lower prevalence of stunting and higher HAZ scores as compared to children in the control villages at the time of the final survey. In addition to these primary outcomes other measures of growth will also be assessed including weight-for-age Z-scores (WAZ), weight-for-height Z-scores (WHZ) and the prevalence of underweight and wasting. Hemoglobin concentration (Hb) will also be used to assess the impact of the program on the prevalence of anemia among these children.

As previously mentioned the E-HFP program is designed to improve the aforementioned outcomes through three primary pathways: 1. Increasing the availability of micronutrient-rich foods through increased household production of these foods; 2. Income generation through the sale of surplus production; and 3. Increased knowledge and adoption of optimal nutrition practices, including the consumption of micronutrient-rich foods. In order to examine how this program could be working or not working through these three pathways a number of secondary outcomes will also be measured in the impact evaluation. Among these are:

1. Household assets;
2. Agriculture production and production of micronutrient-rich foods specifically;
3. Household food security;
4. Income generation through the sale of agriculture goods;
5. Income from other enterprises;
6. Health and nutrition related knowledge and
7. IYCF and care practices.

3. Methods

3.1 Randomized impact evaluation design

The impact evaluation design was motivated by the necessity to generate convincing evidence from which HKI could learn, especially as the program is adapted to a West African context from experiences in Asia and to demonstrate rigorous evidence to donors about the program's effects. The primary challenge in impact evaluation is to establish the counterfactual. That is, the evaluation should answer the following question as convincingly as possible, "What would have happened to the program beneficiaries if the program had never been implemented?". Without a convincing counterfactual, it would be difficult to determine whether beneficiaries were benefitting from broader macroeconomic trends in the economy, other confounding factors, or the program itself.

Despite observing beneficiaries before and after the program implementation, several sources of bias exist which could confound the estimation of the program's true impact. The first source of bias is a selection bias whereby different observable or unobservable characteristics of a program's beneficiaries might allow them to have a greater probability of being included in the program. For example, beneficiaries with higher ability, political influence or motivation might be more likely to be included in a program if beneficiaries were able to self-select into the program. However, these unobserved characteristics would also likely be correlated with program outcomes and hence bias the effect of the program by not taking into account the self-selection of beneficiaries. A second source of bias in program impact estimates is whether the program itself targets beneficiaries. If targeting of program activities is based on need of the population, then programs implemented with poorer households could potentially underestimate the program's average effect.

An impact evaluation design must take into consideration how these sources of bias will be addressed in the final evaluation. To construct the most credible counterfactual, the impact evaluation design has been randomized across districts after stratifying villages based on population size to ensure that all potential program beneficiaries had an equal probability of

being selected into the program. The impact evaluation design also proposed to randomly select a control group that will be monitored throughout the program's implementation to which the treatment group can be compared.

In addition to establish a treatment and control group, the E-HFP was interested in better understanding whether different types of BCC field agents could affect program impact. With this idea in mind, two treatment groups were designated, both of which received the same agricultural intervention while the first treatment group had a set of BCC field staff that were composed of older influential women in the community, while the second treatment group had a set of BCC field staff that were made up of the members of the village health committee.

While the randomized impact evaluation design permits rigorous estimates of the impact of the E-HFP across its treatments, it is imperative that measurement of key outcome indicators and potentially important household, mother and child characteristics are measured from households before the program is initiated and after its completion. In the following section, the issue of questionnaire design and measurement are further elaborated.

3.2 Questionnaire design

The questionnaire design reflects the design of the E-HFP project in the multiple sectors in which it intervenes **(Table 3.1)**. The units of analysis for the impact evaluation are the household and the individuals within households (men, women, and children). The questionnaire, therefore, contains some questions that are collected at the household level and others that require individual information. Of particular interest in this program are the effects of the program on changes in the indicators measured for women and children. As a result there are a number of sections that focus on outcomes related only to women or children of the participating households.

Some sections of the questionnaire are specifically designed to provide information on potential mechanisms through which the program may have larger impact. For example, though the project does not directly intervene in the education sector, we might anticipate that better educated beneficiaries may absorb nutritional lessons more rapidly than those less educated beneficiaries. Therefore, education of participants and other household members is a potentially important mechanism through which the program might have an impact. Further, we measure some facets of household activities, such as labor activities, because we may be potentially interested in investigating whether program participation displaces other renumerative activities. For example, if gardening is relatively time intensive than women may be hesitant to continue gardening activities in the future if this displaces other activities that they were undertaking before the program was initiated.

The questionnaire is structured with these questions in mind. The questionnaire begins by asking the head of household to provide information on the household's members, their education, health and dwelling characteristics. Then male and female respondents answered questions about their assets, agricultural production, labor allocations, food security and non food expenditures, among others, in sections 5-14. Next, the person in charge of food preparation in the household, usually the wife of the head of household, is asked about food consumption of the household. Lastly, the mother of any child in the household 3-12 months are asked questions in

section 16-24 which explore the child's health and nutrition, the mother's knowledge of nutritional information and her actual practices with the child, and finally measures of children's height and weight which form our key indicators for the study. **Table 2.1** provides an outline of the questionnaire structure and a brief description of the information captured in each section.

Table 3.1: Baseline Household Questionnaire Structure

Module	Description
1. Household Roster	A listing of the demographic characteristics of the household members
2. Education	Information on the educational background and current educational status of all household members.
3. Health	The health status of all individuals within the household including recent illnesses and treatment sought.
4. Dwelling Characteristics	Basic characteristics about the household's primary dwelling including the materials with which it is constructed and access to water and electricity.
5. Assets	Assets owned by the household's men and women.
6. Agriculture	This section of the questionnaire is divided into four subsections (plots, production, input utilization, and labor allocation). Plot characteristics includes information on the manager of the plot, size of the plot and crops planted by season. The production section measures agricultural production at the crop-plot level. Input utilization and labor allocation is also recorded at the plot level.
7. Food Security	These questions assess the vulnerability of the household with respect to the frequency of food eaten and it's quality.
8. Livestock	Livestock holdings, revenue from livestock and costs of holding livestock of female household members
9. Sales of Animal Products and Other Revenue Sources	This section captures income from sale of agricultural byproducts.
10. Household Enterprises	Non-farm sources of income, costs of non-farm activities of male and female household members
11. and 12. Labor	This section collects information on individual's participation and hours of work in market and own production activities.
13. Shocks	Unexpected events that may affect household's well-being and the responses taken by the household.
14. Nonfood Expenditures	Expenditures on household items, clothing, and personal expenditures over the past month.
15. Food Expenditures	Interview with the person in charge of food preparation in the household on food expenditures and quantities consumed by the household
16. IYCF Practices	This section asks questions about infant and young child feeding practices to the primary caregiver of the child.
17. Child Immunization and Health	This section asks questions related to the immunization history of the child as well as some health related questions.
19. Mother's Health/Nutrition Knowledge	Knowledge related to optimal infant and young child care and feeding practices. These questions are asked to the primary caregiver of the child.

Module	Description
20. Child Care Practices	The questions in this section are related to child care practices.
21. Mother's Stress	Interview with the mother of the target child that asks questions related to symptoms and problems associated with stress.
22. Post-natal depression	Interview with the mother of the target child that asks questions related to symptoms of postnatal depression.
23. Hygiene	Cleanliness of the child, mother, and the interior and exterior of the house using a spot-check observation method.
24. Anthropometry and hemoglobin	This section takes physical measurements of all children in the household 3-12 months and their mothers. In addition, the hemoglobin concentration of children was also measured to assess anemia status.

3.3 Sampling and Sample Size

The sample design of any survey is paramount to providing a representative image of the characteristics of the population of interest to the study. For the purposes of evaluating the effect of the E-HFP project, it was necessary to first consider multiple factors in constructing a sample frame. The first factor was geography with the focus on the region of Fada N'Gourma within Burkina Faso where HKI has experience in implementing projects. In order to avoid biasing the results due to participation in other programs that included village gardening, four districts where HKI and other NGOs had little previous activity were chosen to participate in the E-HFP program. Prior participation in a similar type of program would potentially bias the results if there is some adaption to gardening over time, as villages who had more gardening experience through HKI might seem as if the gardening projects were quite productive, when in fact, this was a spillover impact of a previous project. The health system intervenes in most villages in the district, so it's interventions could be considered as a constant across both treatment and control villages. A second factor of importance was whether a village would be able to undertake a village gardening project. Practically, this meant that the village had to have some access to water in the dry season to undertake village gardening. In the four districts chosen, villages that had some access to water in the dry season were identified. After these two criteria, a geographically-focused area and a list of villages within these areas that had access to water in the dry season, we conducted an enumeration of the households of children in the qualifying villages who were 12 months of age or younger.

This is where our ideal research design and statistical power tests[1] required some compromise. From a nutritional perspective, we would expect that nutritional information and improved nutritional practice would have a significant impact on children from 3-9 months as this would allow children to be exposed to at least one year of program participation during the critical window of development (before 2 years of age). However, after undertaking an enumeration of the child population in the identified sample frame, too few children were identified in this age group to be able to detect reasonable changes in the outcome variables of interest. Therefore, we decided to include all children in selected villages up to 12 months. This compromise potentially dilutes the ability to estimate with statistical precision the program's effect. In our final analysis, we will estimate impact effects for both the 3-9 month and 3-12 month sample of children.

After determining eligible villages and children in each village, we randomly selected villages into three groups: a group of 15 villages which would receive a village gardening intervention and nutritional counseling from six older influential women ("older women" group, group 1), a group of 15 villages which would receive the same village gardening intervention and receive nutritional counseling from a committee composed of six village members including both men and women ("village committee" group, group 2), and 25 control villages where no program interventions would be undertaken (control group, group 3). We selected the sample after stratifying, or ordering the list of villages, by department and village size to ensure a relatively balanced distribution of village sizes and geographic locations between treatment (group 1 and 2)

[1] Power tests are statistical tools to assess the minimum sample size required to detect an estimated effect of the program, given some information on the mean and standard deviation of this outcome variable in the sample population.

and control villages (group 3).[2] The list of villages and the number of children selected in each village is presented in **Table 3.2**. The geographic distribution of the villages is presented in **Map 1**. The final sample selected yielded 512 observations in group 1; 514 observations in group 2; and 741 observations in the control group. The number of observations is not equal between the two control groups and treatment groups because of differences between the enumerated number of children in the target age range 3-12 months and those that were actually found in the villages at the time of the baseline survey. The total number of observations in the treatment group and the control group were initially determined by power calculations to ensure that the study was designed with a reasonable amount of statistical power to ensure detection of likely program impacts.

[2] Village population estimates were provided by the Health District of Fada. These estimates were extremely useful in planning our research. Upon completing our own census of households in the village, we found these estimates to generally overestimate the population as they were extrapolations based on an annual 3% population growth rate from the 1998 census.

Table 3.2: List of Villages by Group

Group 1: "older women" villages

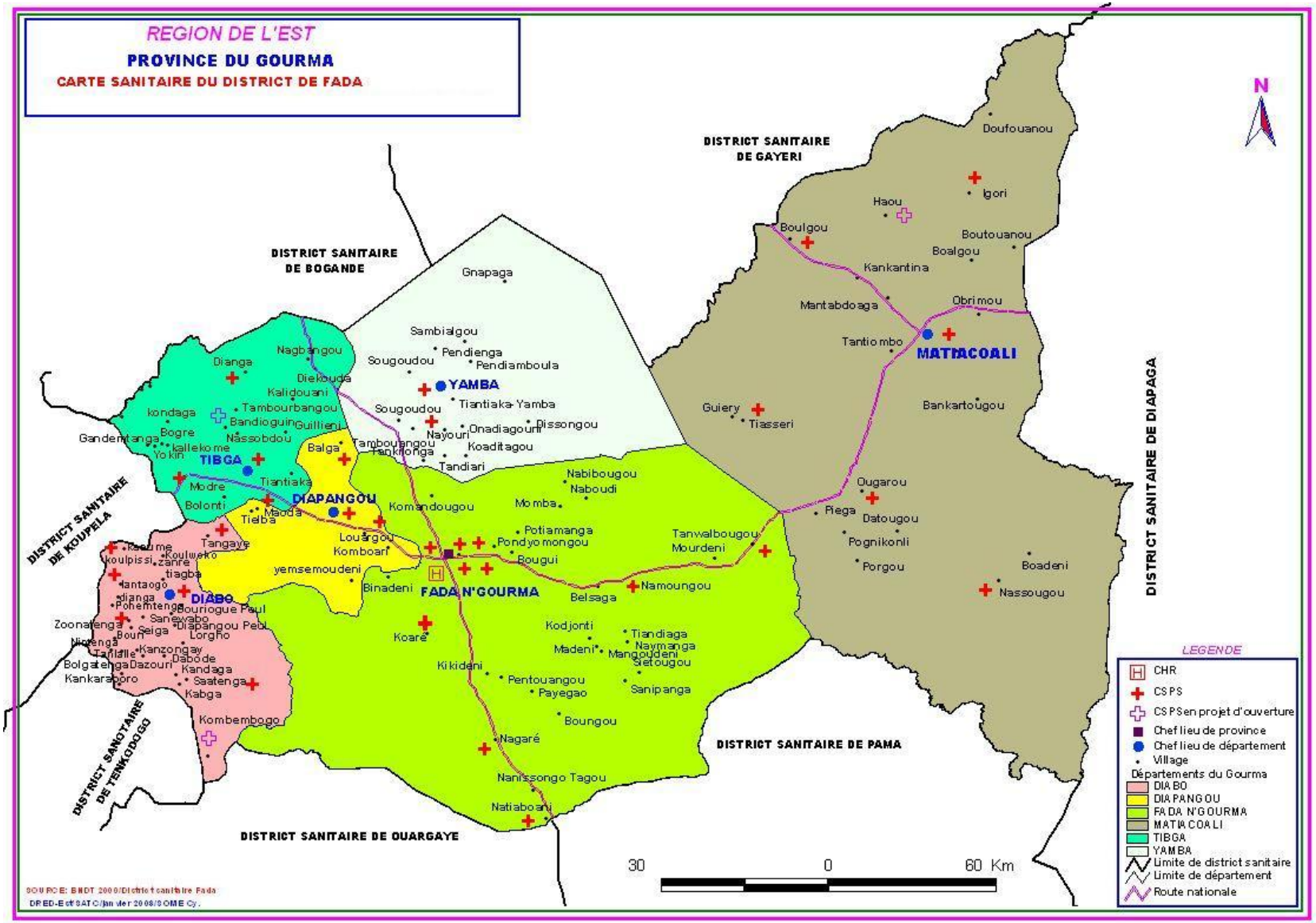
Department	Formations Sanitaires (Health District?)	Village Name
DIAPANGOU	BALGA	Bassabliga
DIAPANGOU	BALGA	Tiangou
DIABO	DIABO	Zecnabin
DIABO	ZONATENGA	Silmitenga
DIABO	TANGAYE	Zanré
DIABO	ZONATENGA	Zonatenga
TIBGA	BONDIOGHIN	Kontaga Mossi
TIBGA	TIBGA	Bassembili
TIBGA	MOODRE	Bolontou
TIBGA	MOODRE	Tampour
TIBGA	MOODRE	Bogré
YAMBA	YAMBA	Yamba
YAMBA	YAMBA	Dini yala
YAMBA	YAMBA	Tantiaka-Yamba
YAMBA	NAYOURI	Nayouri

Group 2: "village commitee" villages

Departement	Formations Sanitaires	Village Name
DIAPANGOU	DIAPANGOU	Comboari
DIAPANGOU	LOUARGOU	Fonghin
DIABO	DIABO	Lorgo
DIABO	KOULPISSY	Koulpissy
DIABO	LANTAOGO	Pœsemtenga
DIABO	SAATENGA	Kabghin
DIABO	SAATENGA	Konryoghin
DIABO	ZONATENGA	Siéga
DIABO	ZONATENGA	Yanwèga
DIABO	TANGAYE	Nabisrabogo
TIBGA	TIBGA	Nassobdo
TIBGA	TIBGA	Guilyende
TIBGA	MAODA	Natenga
YAMBA	NAYOURI	Kondoagou
YAMBA	YAMBA	Pimpigdou

Table 2.2 (cont.)

Group 3: Control Villages		
Departement	**Formations Sanitaires**	**Village Name**
DIAPANGOU	BALGA	Takoagou
DIAPANGOU	DIAPANGOU	Diapangou
DIAPANGOU	DIAPANGOU	Tilonti
DIAPANGOU	LOUARGOU	Louargou
DIAPANGOU	BALGA	Tchomboado
DIAPANGOU	LOUARGOU	Yensemdeni
DIABO	COMBEMBOGO	Tanzienga
DIABO	COMBEMBOGO	Combembogo
DIABO	DIABO	Diabo
DIABO	DIABO	Yantenga
DIABO	KOULPISSY	Lantille
DIABO	LANTAOGO	Lantaogo
DIABO	SAATENGA	Kamona
DIABO	SAATENGA	Louloubtenga
DIABO	SAATENGA	Saatenga
DIABO	TANGAYE	Koulwoko
TIBGA	BONDIOGHIN	Bondioghin
TIBGA	DIANGA	Dianga
TIBGA	DIANGA	Guidbilin
TIBGA	DIANGA	Malboara
TIBGA	TIBGA	Dekouda
TIBGA	TIBGA	Tiantiaka
TIBGA	MOODRE	Moodré
YAMBA	YAMBA	Koulga
YAMBA	YAMBA	Pampanga



Map 1: Repartition of villages in Gourma Province

3.4 Fieldwork Preparation, Data Collection and Data Entry

The fieldwork preparation began with the research design where two trips were made to Burkina Faso by IFPRI staff to collaborate with HKI and in particular the Head of Monitoring and Evaluation for the project. Once the randomized program and evaluation design were agreed upon by the E-HFP program staff and IFPRI researchers, the sample frame listing exercises, sampling strategy and questionnaire design described above were conducted jointly between HKI and IFPRI.

To prepare for the fieldwork, HKI recruited five supervisor candidates and approximately 20 enumerator candidates to participate in an extensive training on the finalized questionnaire. Candidate field staff were recruited to participate in the training based on their field experience, local language skills, experience in conducting health surveys, performing anthropometric measures and hemoglobin tests. Supervisors were first trained over a three day period, after which the questionnaire was piloted in a village randomly selected by the Health District of Fada that was not included in the sample selected for the project. Supervisors, HKI staff, a representative from the Health District of Fada, and IFPRI staff participated in the piloting to evaluate questionnaire content including question phrasing, translation of concepts in the questionnaire into local language, order of questionnaire modules, and validation that proposed questions generated the intended baseline information. The pilot also served to differentiate supervisor candidates according to their knowledge of the questionnaire and their skill in conducting interviews in rural villages. After the pilot, three supervisor candidates were selected.

After supervisors were selected, the training of enumerators began over a week long period in which the household and community questionnaires were fully explained to enumerators through participatory group discussions, simulations of interviews and demonstrations of practical skills. Representatives from the Health District of Fada including the Adjoint to the Medecin Chef and a "sage-femme" participated in the training and provided a practical demonstration of the proper method to taking anthropometric measures in the field as well as conducting the hemoglobin test. After enumerator training, another pilot test was undertaken in a selected village by the Health District of Fada where each enumerator conducted interviews to evaluate their understanding of the questionnaire and their technique in conducting interviews in the field. The best enumerators were selected to undertake the fieldwork which began in late February and continued until the end of April.

Throughout the data collection process, completed questionnaires were reviewed by enumerators before turning the questionnaires over to supervisors. Supervisors reviewed questionnaires in the sample villages before exiting the village and returned incomplete or unsatisfactory questionnaires to enumerators who corrected errors in the field by completing the required corrections during a brief re-interview with the household on the particular questions that required correction. Supervisors also monitored enumerators during interviews and randomly returned to households who recently completed interviews to evaluate the quality of the interview with respondents. After supervisors accepted a completed questionnaire, the

questionnaire was handed over to the HKI Director of Monitoring and Evaluation who also spot-checked questionnaires before turning the questionnaire over to the data entry team.

A data entry program was developed by IFPRI staff in EpiInfo which was designed to validate question responses through a set of consistency checks including extreme values, logical consistency and completeness of information. Information on the questionnaires was entered concurrently with fieldwork at the HKI office in Ouagadougou. Any inconsistencies found in the data entry were set back to the field so that information could be correctly collected. At the end of the fieldwork, a database was exported from EpiInfo into multiple formats for the baseline analysis which is described below.

3.5 Data analysis

Creation of variables—International organizations provide several norms and standards against which to assess a number of the outcomes included in this report; these are summarized below. A number of new variables were also created from the baseline data, in order to summarize the results.

1. **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). The children included in the baseline study were between the ages of 3-12 months of age – therefore the use of the WHO-recommended indicators were limited to those appropriate for this age range. The age ranges as defined by the WHO for each indicator are listed in the descriptions below.

   - **Breastfeeding indicators:**
     - **Child ever breastfed**—Proportion of children 0-23 months of age ever given breast milk (based on historical recall of the primary caregiver).
     - **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 (the indicator relies on the historical recall of the primary caregiver).
     - **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.

- **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.

- **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 6-12 months of age that were fed iron-rich food (in this survey this was limited to flesh foods).
  - **Minimum dietary diversity (≥ 4 food groups)—**Proportion of children 6-12 months of age who consumed at least four food groups (out of seven nutrient-rich food groups[3]) in the past 24 hours.
  - **Minimum meal frequency—**Proportion of breastfed children given a minimum number of meals in the past 24 hours. For children 6-8 months of age, the minimum number of meals was set at two and for children 9-12 months of age, the minimum number of meals was set at three.
  - **Minimum acceptable diet—**Proportion of children 6-12 months of age who received the minimum acceptable diet. This indicator was defined as meeting both the minimum dietary diversity and the minimum meal frequency requirements.

2. Anthropometric measures and anemia status:

The children's anthropometric data and hemoglobin concentration (Hb) measures were used to construct the following indicators:

- **Child height-for-age Z-score (HAZ), weight-for-age Z-score (WAZ), and weight-for-height Z-score (WHZ)—**Calculated using the 2006 WHO growth reference (de Onis 2006). Stunting was defined as HAZ < -2 standard deviations (SD), wasting as WHZ < -2 SD, and underweight as WAZ < -2 SD.
- **Child's anemia status –** Categorized based on children's hemoglobin concentration. Anemia was defined as Hb < 11.0 g/dL and severe anemia was defined as Hb < 7.0 g/dL.

Data Analysis—The data were analyzed using SPSS version 18.0 and 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 gender. The final sample size for all variables and indicators is reported in the results tables.

Comparing results between groups—In the subsequent chapters, the analysis makes comparisons between the three groups within our dataset. The three groups include treatment

[3] 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.

group one where six older influential women lead the BCC strategy in addition to the agricultural interventions ("older women" group, group 1), treatment group two where a committee composed of six village members including both men and women lead the BCC strategy in addition to the agricultural interventions ("village committee" group, group 2), and the control group (group 3).

4. Results

4.1 Village descriptives

In this section, the profile of villages of included in the baseline survey is presented. All of the data is disaggregated by the three groups of interest for this study: the "village committee" group, the "older women" group and the control group. The information on the geographic distribution of villages across *Departements* (departments) and *Formations Sanitaire* (health districts) are described above. In both the older women and village committee groups, 15 villages were selected for a total of 30 villages which receive targeted nutritional information and an agricultural intervention, while 25 villages were selected as control villages.

Table 4.1 presents descriptive statistics on village access to infrastructure and health facilities. In general, the villages in the baseline are rural with limited access to electricity to potentially facilitate commerce or agricultural production and processing, among other activities. In fact none of the villages included in either of the two treatment groups had access to electricity and only 12% of the control villages had access to electricity. Access to drinking water across the three groups of villages was through *forages* which are deep well pumps. In both the treatment groups, both the older women and committee groups have equal access to *forages* (86.7%), while the control group had 92% of villages with access to *forages*. The older women's treatment group had 13.3% of its villages with access to standard wells, while 6.7 % of committee group villages had access to water via a piped water system (robinet).

Table 4.1: Descriptive statistics on village access to infrastructure, health and education facilities

Village Characteristics	Treatment: Older Women	Treatment-Village Committee	Control
Panel A: Infrastructure			
% of villages with electricity	0	0	12
Primary source of drinking water (% with access to:)			
Robinet	0	6.7	0
Forage	86.7	86.7	92
		6.6	8
Well	13.3		

Rain water	0	0	0
River/lake water	0	0	0
Panel B: Health and Education Facility Access			
Access to health facilities (% of villages with access to:)			
Hospital	15.6	6.1	15.9
Centre de santé	56.2	51.5	70.5
Poste de santé/dispensaire	18.8	27.3	13.6
Tradi-practicien	9.4	15.1	0
Access to school facilities (% of villages with access to:)			
Primaire	50	68.4	76.7
Second cycle	9.1	5.3	6.7
Number of villages	15	15	25

Lastly Table 4.1, Panel B, data related to access to health and education facilities is presented for each of the three groups. Four types of health facilities were identified by respondents as the most frequently used by households residing in the villages that participated in the baseline study. These included hospitals, *Centre de Santés*, Poste de santé/Dispensaire and traditional practioners. Although the majority of villages had access to a *Centre de Santé* (56%, 52%, 71% of villages in the older women, village committee and control groups, respectively); the control group had the highest percentage of villages with access to this type of health facility. Sixteen percent of villages in both the older women's group and control group had access to a hospital, while only 6 % of villages in the village committee group had access to a hospital. Both treatment groups also reported using traditional practitioners with 9% of villages in the older women's group and 15% of villages in the village committee group, although none of the villages included in the control group reported accessing this type of health care. Considering the implications of these statistics on household health, the village committee group seems to have less access to hospitals than either the older women's or control groups and the control group has more villages with access to *Centre de Santés* and less to Poste de santé/Dispensaire as compared to villages in the two treatment groups. Depending on the type of staff, equipment and supplies available at these various types of health services, the data imply that the control group likely has more access to the highest quality health care available in the area (i.e. hospitals and *Centre de Santés*) and is less likely to use traditional practitioners than the two treatment groups. In addition the village committee groups seems to have the lest access to the two types of health care that are likely to be able to provide the best care. Data related to the access to schools is also

presented in Panel B.The control group has the highest percentage of villages (77%) who have access to primary schools, while the older women's group of villages has the highest access to secondary schools with 9% of villages having access.

The primary crops cultivated and access to irrigation at the village level are summarized in **Table 4.2**. Among the two treatment groups, there are differences between the older women's villages where 32% of villages had access to irrigation, while only 18% of villages in the village committee group had access to irrigation. The control group had a similar level of access to irrigation as that of the older women's group of villages with 33% of villages in the control group reporting access to irrigation. Irrigation in this part of Burkina is particularly important in the dry season where water constraints during the dry season make production impossible without access to irrigation or other water sources.

Table 4.2 also reports the various crops that are cultivated among the villages where it is possible that villages cultivate multiple crops. The most frequently produced crops at the village level include millet, beans and sorghum, though other crops are produced with varying intensities across the survey villages. The frequency of crop production across the three village groups is relatively balanced. That is, the percentage of villages across any particular crop is relatively equal across the three groups.

Table 4.2: Access to irrigation and crop choice at the village level

Agriculture	**Treatment: Older Women**	**Treatment-Village Committee**	**Control**
% of villages with:			
Irrigation (1=yes)	31.6	17.7	32.6
Crops cultivated:			
Riz	6.67	8.49	7.3
Mil	14.29	14.15	12.92
Sorgho	14.29	14.15	12.92
Mais	13.33	11.32	13.48
Fonio	0	0	2.81
Haricot	12.38	13.21	14.04
Tomates	0.95	0	1.69
Gombo	5.71	6.6	6.74
Pasteque	0.95	0	0.56
Arachide	13.33	12.26	8.43
Sesame	8.57	9.43	8.99
Piment	0	1.89	0.56
Aubergine	0.95	0	1.12
Manioc	1.9	0	0
Patate douce	1.9	2.83	2.25
Poids de terre	4.76	5.66	6.18

Number of villages	15	15	25

4.2 Household Characteristics

In this section, a profile of the households included in the baseline survey is provided. As in the previous section, we disaggregate all data by the three groups of interest for the study: the "older women" group, the "village committee group" and the control group. The household profiles consist of a description of household demographics, welfare indicators such as asset and livestock holdings, and household production and food security indicators.

Household Demographics - Table 4.3 provides a description of the household's size, whether the household is headed by a female, and the education levels of both the household head and the child's mother. In the baseline survey, households were defined as the group of persons who are resident in the household for at least 6 months who contribute to the provision of household meals and intermingle income from common productive or agricultural activities together. The household size observed in the baseline varied between an average of 7 and 7.5 household members. One striking feature of household composition that is often noted is the percentage of households who are female headed as female headed households may have less access to labor markets or may be more vulnerable if in traditional societies like Burkina, a male head is not the head of household. In our baseline data, the percentage of female headed households range between 8-9% across the three groups.

The last salient household demographic characteristic that we investigate in Table 4.3 is the educational attainment of either the household head or the targeted child's mother. The educational attainment of household heads is slightly higher than that of the targeted children's mothers. However, both rates of primary and secondary school attainment are quite low with no group passing 10 percent. Primary attainment of household heads varies between 7-9% for the three groups, while primary attainment for targeted children's mothers varies between 5 and 6 percent.

Table 4.3: Household Demographics

Variable	Treatment: Older Women	Treatment-Village Committee	Control
	512	513	738
HH size of those resident 6 months or more	7.5	6.9	7.6
	(3.7)	(3.5)	(3.8)
	510	510	736
Female Headed Household (1=yes)	8.6%	9.0%	7.6%
Education of household head (% who have completed)	509	508	729
Primary	9.4	7.1	8.1

Secondary	2.8	1.6	2.1
Education of child's mother (% who have completed)			
Primary	4.8	6.1	5.1
Secondary	1.7	0.7	1.5

For each variable the number of observations, mean, and standard deviation in parenthesis (if necessary) are presented.

Measures of Household Welfare - Three different measures of household welfare which describe different aspects of the household's material well-being are reported. These include household assets, livestock holdings and expenditures on certain food items. Assets and livestock are disaggregated by gender to provide a comparison of asset holdings.

In **Panel A of Table 4.4**, the asset count of men, women and the household are compared by treatment and control groups. These asset counts can be compared with **Panel B of Table 4.4**, which present the value of asset holdings by men, women and the household. One striking pattern in this table is that though men hold fewer numbers of assets, the value of these assets is much higher than assets held by women. In panel A, the count of men's assets varies between 16 and 17, while that of women's assets varies between 30 and 33 items. In comparison, panel B provides the value of these assets which vary, for men, between 113,517 FCFA and 140,982 FCFA, while for women the value of assets held varies between 41,524 FCFA and 51,275 FCFA.

Table 4.4: Household asset holdings by gender

	Treatment: Older Women	**Treatment-Village Committee**	**Control**
Panel A	512	512	619
Asset Count--Men	17.1	16.3	16.3
	(12.3)	(13.0)	(11.2)
	512	513	619
Asset Count--Women	30.3	30.3	33.2
	(17.5)	(18.9)	(20.5)
	512	512	618
Asset Count--HH	47.4	46.5	49.2
	(23.9)	(25.9)	(25.7)
Panel B			
	511	508	618
Asset Value--Men	140,982	113,517	133,913
	(174,818)	(155,499)	(162,493)
	512	512	618
Asset Value--Women	50,651	41,524	51,275
	(61,488)	(42,968)	(49,585)
	512	503	616

Asset Value--HH in FCFA	186,432	147,401	181,845
	(188,319)	(154,472)	(181,845)

For each variable the number of observations, mean, and standard deviation in parenthesis (if necessary) are presented.

Turning to another measure of household asset holdings, we examine livestock holdings, again by gender in **Table 4.5**. The table is divided into two panels where Panel A presents the count of livestock held by men and women, while Panel B presents the value of these livestock. Men hold the majority of livestock both in number of animals, but also in the value of these animals. Variation in animal holdings for men ranges between 24 and 28 animals, while women's holdings are estimated to be 5 animals across the three groups. The value of men's livestock holdings vary between 584,832 FCFA and 665,168 FCFA, while the value of women's livestock holdings ranges from 29,246 FCFA to 39,021 FCFA.

Table 4.5: Household livestock holdings by gender

	Treatment: Older Women	**Treatment-Village Committee**	**Control**
Panel A			
Livestock Count—Men	26	24	28
	(25)	(22)	(27)
Livestock Count--Women	5	5	5
	(6)	(6)	(7)
Livestock Count--HH	31	28	33
	(27)	(25)	(30)
	506	509	728
Panel B			
Livestock Value--Men	644,052	584,832	665,168
	(943,638)	(770,406)	(836,021)
Livestock Value—Women	32,773	29,246	39,021
	(68,775)	(59,735)	(89,371)
Livestock Value—HH	672,731	608,207	695,566
	(962,239)	(785,997)	(862,074)
Number of households	512	513	735

For each variable the mean and standard deviation in parenthesis are presented.

The last measure of household welfare that we consider is expenditures on food items over the previous seven days. While our previous indicators of household welfare attempted to capture wealth by measuring household assets or livestock holdings, expenditures also provide a measure

of welfare by investigating a household's expenditures over different consumption categories. Whereas assets might be considered a stock of household wealth, expenditures capture a flow of daily expenses that provide a different dimension of welfare. We present information on household food expenditures including the total expenditure over the previous seven days as well as expenditures on a per adult equivalent basis. Measuring food expenditures on a per adult equivalent basis is particularly important because the nutritional requirements of adults relative to children and household composition should be taken into consideration when comparing expenditures across different types of households.

Both total and adult equivalent total expenditures are slightly larger in control villages than in the treatment villages. While total expenditures in both the older women and village committee groups are essentially equivalent, household size is slightly lower in the village committee group which renders the per adult equivalent expenditures higher in the village committee group relative to the older women's group. Of particular interest is to examine patterns of food expenditures across the groups in different categories of food. We disaggregate expenditures into cereals, root vegetables, vegetables, fruit and meat and fish. The village committee group has lower expenditures on cereals relative to the other two groups which is somewhat surprising given that cereals are an essential component of diets in this area. It is important to note when considering expenditure data trends that households in these villages are both producers and purchasers of food items, so variations in expenditure patterns do not necessarily imply lower overall consumption of an item. Households in the village committee group tend to spend slightly more on root vegetables and vegetables than other households in either the older women and control groups. We noted earlier that the control group villages had higher total and per adult equivalent expenditures. From the disaggregated data by food category, the descriptive statistics suggest that the control group villages had higher expenditures in the meat and fish category and somewhat higher expenditures in the cereals and fruits categories.

Table 4.6: Household food expenditure over the previous seven days

Food Consumption and Expenditure	Treatment: Older Women	Treatment-Village Committee	Control
Total Food Expenditure	2317	2300	2572
	(2540)	(2359)	(2812)
Total Food Expenditure per Adult Equivalent	601	663	677
	(713)	(779)	(804)
Total Expenditure-Cereals	707	540	784
	(1607)	(1167)	(1661)
Total Expenditure per AE-Cereals	173	154	217
	(356)	(384)	(534)
Total Expenditure-Root Vegetables	46	38	20
	(578)	(199)	(148)
Total Expenditure per AE-Root Vegetables	10	11	5
	(101)	(54)	(39)

Total Expenditure-Vegetables	363	454	413
	(690)	(772)	(699)
Total Expenditure per AE-Vegetables	95	134	111
	(159)	(260)	(188)
Total Expenditure-Fruit	29	34	75
	(105)	(98)	(494)
Total Expenditure per AE-Fruit	8	10	19
	(25)	(30)	(137)
Total Expenditure-Meat and Fish	631	621	857
	(975)	(859)	(1,267)
Total Expenditure per AE-Meat and Fish	170	178	216
	(329)	(268)	(336)
Number of households	510	512	737

For each variable the mean and standard deviation in parenthesis are presented.

Agricultural Production - Because an important component of the E-HFP program is to increase agricultural production and food availability in the household, we collected detailed production data to assess baseline characteristics of agricultural production. In **Table 4.7**, we summarize some of these variables including the hectares cultivated, the number of plots cultivated by household, production of selected crops over the last agricultural season and input utilization by plot.

Households across the three groups cultivated a similar number of hectares and plots. On average, households cultivated 3.5-3.6 hectares over 2.3-3.7 total household plots. What was planted across these plots varied across villages, but we present production statistics for three of the main crops cultivated in the baseline village sample including millet, beans and sorghum. Total production was similar across groups with villages in the older women group producing 2.2 metric tons of sorghum while control group villages produced 2.6 metric tons. This trend of higher production in the control group villages was consistent across the three crops we investigate here. Production of beans was slightly higher among the village committee households than in the older women households, but production of sorghum was slightly higher among the older women households in comparison to the village committee households. Turning to the input utilization data which we analyze at the plot level rather than the household level, we see that input utilization is relatively low across all crops and does not vary significantly among the three different groups. The most frequent input among fertilizers, herbicides/pesticides/insectides, and manure that we considered in the baseline survey was manure with 28-29 percent of households reporting manure usage. Relative to other inputs, this is not altogether surprising because manure is usually produced by animals in agricultural households or readily available in villages for little, if any cost, whereas the other two types of inputs are costly and not always readily available in local markets.

Table 4.7: Characteristics of agricultural production

Agricultural Production	Treatment: Older Women	Treatment-Village Committee	Control
	508	504	730
hectares cultivated	3.5	3.5	3.6
	(2.6)	(2.7)	(2.6)
Number of plots	3.2	3.7	3.2
	(2.2)	(2.1)	(1.8)
Total production in kg of main crops			
	419	374	573
Millet	2,200	2,398	2,622
	(2,288)	(3,851)	(2,160)
	65	70	96
Beans	1,502	1,749	1,782
	(1,412)	(2,218)	(1,462)
	17	38	48
Sorgho	1,575	1,290	2,665
	(1,413)	(1,029)	(5,686)
Input utilization by plot (1 if yes)			
Fertilizer	12.7	12.3	11.2
Pesticides/herbicides/insecticides	2.9	5	4
manure	27.6	28.5	28.9
Number of plots	1,666	1,898	2,323

For each variable the number of observations, mean, and standard deviation in parenthesis (if necessary) are presented.

Household food security - Across the households included in the baseline survey, the aspects of household hunger that were most commonly experienced included; not being able to eat preferred foods, having to eat a limited variety of foods, being worried about not having enough food and having to eat foods that people really did not want to eat (**Table 4.8**). Although more than half of the households reported that they were not able to eat preferred foods or had to eat a limited variety of foods, very few households reported having more severe experiences related to household hunger such as not having any food in the house, having to go to bed hungry or having to go a whole day and night without food.

Household experiences related to household hunger differed between the treatment groups **(Table 4.8)**. Overall households in the villages assigned to the village committee treatment group were more likely to report that they had experienced different aspects of household hunger such as worrying about not having enough food, having to eat a limited variety of foods and having to eat fewer and smaller meals. Households in the villages assigned to the "Control"

group were more likely than the other two groups to report that they had no food in the house at some point in the previous four weeks, one of the most severe indicators of household hunger.

Table 4.8 Household hunger[a]

	Person responsible for preparing meals			
		Treatment group		
	Full sample	Older women	Village committee	Control
	N = 1755	N = 511	N = 507	N = 737
Household hunger (in the past 4 weeks)				
Worried about not having enough food	45.4	42.1	51.1	43.7
Were not able to eat preferred foods	67.7	66.2	68.7	68.1
Had to eat a limited variety of foods	51.8	50.4	59.4	47.5
Had to eat foods you did not want	42.1	39.6	48.0	39.8
Had to eat a smaller meal	16.8	13.5	20.7	16.4
Had to eat fewer meals	14.7	11.1	18.1	14.9
Had no food in the house	3.0	1.4	3.0	4.2
Went to bed hungry	3.6	2.5	4.3	3.9
Did not eat for a whole day	2.4	1.8	3.3	2.2

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

4.3 Primary Caregiver Feeding, Care, and Health Knowledge

Feeding practices— Caregiver knowledge related to key infant feeding practices was limited. Less than half of the respondents knew that children should be breastfed within the first hour after birth; however 73% knew that children should be given colostrums **(Table 4.9)**. Related to the timing of the introduction of liquids other than breast milk and semi-solid or solid foods - 17% of caregivers stated that children less than 6 months of age should not be given liquids (e.g. water) other than breast milk. Caregivers stated that children should start receiving liquids at a much younger age, 3.2 (2.6) months of age on average with a range of 0-18 months of age although only 3% reported that children should begin receiving liquids after 6 months of age. Forty percent of caregivers correctly stated that children should start receiving semi-solid foods at 6 months of age; however half believed that they should start receiving foods at a later age, with the average reported age being 7.1 (2.3) months with a range of 0-36 months of age.

Caregivers also had limited knowledge related to the identification of vitamin A-rich foods. Less than half of the sample correctly identified a vitamin A-rich food. Twenty-one percent correctly identified one food, 16% two and 4% three good sources of vitamin A (data not shown). The most commonly mentioned food sources were dark green leafy vegetables, yellow or orange fruits and vegetables and eggs.

Caregivers in the control villages were more likely to correctly report that children should be given colostrum as compared to caregivers in the two treatment groups with caregivers in the

older women's villages being the least likely to say that children should be given colostrum. In addition, caregivers in the control villages were also more likely to correctly state that children should begin receiving liquids other than breast milk and complementary foods at 6 months of age as compared to caregivers in the two treatment groups.

Table 4.9 Feeding knowledge of caregivers[a]

	Caregivers of children 3-12 months of age			
		Treatment Group		
	Full sample	**Older women**	**Village committee**	**Control**
	N = 1749	**N = 504**	**N = 515**	**N = 730**
Feeding knowledge: percent who gave right answer:				
Children should be breastfed less than one hour after birth[b]	45.5	45.7	44.7	45.9
Children should be given colostrum[c]	72.7	64.2	70.6	80.1
Children < 6 months of age should not drink other liquids[d]	17.3	14.1	19.8	17.8
Reported age in months at which children should receive liquids[e]				
Percent women who said 6 months	31.6	22.1	30.9	38.8
Percent women who said < 6 months	65.3	75.7	65.9	57.8
Percent women who said > 6 months	3.0	2.2	3.2	3.5
Reported age in months at which children should receive semi-solid foods[f]				
Percent women who said 6 months	39.3	34.7	38.1	43.3
Percent women who said < 6 months	10.8	11.2	13.0	8.9
Percent women who said > 6 months	49.9	54.0	48.9	47.8
Vitamin A-rich foods[g]				
Orange fruits and vegetables	18.1	17.8	19.9	16.9
Dark green leafy vegetables	18.7	19.0	23.0	15.4
Eggs	16.1	15.8	17.1	15.7
Liver	3.1	3.0	2.8	3.3
Breast milk	8.6	9.4	5.9	9.8
Cow's milk	2.8	3.4	2.4	2.8
Other	24.2	20.4	22.6	27.9

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

Preventing diarrhea and intestinal worms — When asked about when hands should be washed the two most commonly reported times were before eating (55%) and before feeding a child (38%) **(Table 4.10)**. Far fewer respondents mentioned that hands should be washed after using the toilet or cleaning a child who has defecated. Specific knowledge related to the prevention of intestinal worms was very limited in this population. Only 22% of respondents mentioned washing hands as a means of prevention and 14% giving children purified or treated water. Other less commonly mentioned means of prevention included cleaning fruits and vegetables, cutting nails and wearing pants or shoes.

Caregivers in the control communities were more likely to mention that hands should be washed before eating and before feeding children but less likely to mention washing hands after cleaning a child who has defecated as compared to respondents from the two intervention communities.

Treating diarrhea— The vast majority of people (86%) stated that children should be taken to a medical center when they are suffering from diarrhea **(Table 4.10)**. Very few people (9%) mentioned that children should be given oral rehydration salts for the treatment of diarrhea. Giving children traditional medicines to treat diarrhea (19%) was more commonly mentioned than giving ORS (9%); however these answers were not necessarily mutually exclusive since respondents were asked to list as many means of treatments as they would use. Other less commonly mentioned treatments included giving decoctions and hot water, among others.

Caregivers in the villages assigned to the older women's group were more than twice as likely as caregivers from the control villages to mention giving traditional medicines for the treatment of diarrhea. Caregivers from the control villages were the most likely to mention taking children to a medical center for the treatment of diarrhea but least likely to mention giving ORS (92% and 5% respectively). Whereas caregivers from the villages assigned to receive BCC messages from the village committees were the least likely to mention taking children to a medical center and the most likely to mention giving ORS for the treatment of diarrhea (77% and 13%, respectively).

Feeding during illness— Knowledge about ideal practices related to feeding children during illness appears to be limited among this population. When asked how they should feed a sick child only about one-third of the caregivers interviewed correctly stated that they should increase the amount of food given to children when they are sick, 26% said they would give the same amount food and 20% said they would give less (Table 4.10). Likewise only 22% of caregivers said that they should give more liquids during illness and only 5% of the caregivers mentioned both giving more food and more liquids to a sick child (data not shown). Sixteen percent mentioned that they would continue breastfeeding a sick child.

The only significant difference among the groups related to feeding during illness was that caregivers from the control group were more likely to report that children should continue to be breastfed during illness as compared to the two intervention groups (18% for the control group versus 15% for the health committee group and 13% for the older influential women's group).

In general the statistically significant differences across the intervention groups in relation to health and care knowledge followed the general pattern of caregivers from the control group being the most likely to mention ideal practices, followed by caregivers from the two intervention groups.

Table 4.10 Health and care knowledge of primary caregivers[a, b]

	Caregivers of children 3-12 months of age			
		Treatment Group		
	Full sample	Older women	Village committee	Control
	N = 1749	N = 504	N = 515	N = 730
Washing hands: percent who said you should wash your hands…				
Before eating	55.3	51.0	54.2	59.0
After using the toilet	14.7	14.1	17.3	13.3
Before feeding a child	38.0	30.6	35.3	44.9
After cleaning a child who has defecated	17.8	21.6	19.4	14.2
Preventing intestinal worms: percent who said…				
Wash hands	22.4	21.8	21.1	23.7
Cut nails	1.6	2.4	2.2	0.6
Clean fruits and vegetables	8.6	11.5	10.0	5.7
Give child purified water	14.2	15.1	13.9	13.6
Wear pants	3.4	2.4	5.4	2.6
Wear shoes	1.1	1.6	1.6	0.4
Treating diarrhea: percent who said…				
Give ORS	8.7	10.0	12.5	5.1
Give traditional medicine	18.5	25.1	20.4	12.6
Take to medical center	84.4	81.3	77.0	91.8
Give purified water	0.5	1.2	0.4	0.1
Breastfeeding a child who is sick: percent who said…				
Continue breastfeeding	15.9	13.1	15.2	18.3
Feeding a sick child: percent who said…				
Feed less	20.8	18.8	21.0	21.9
Feed the same	26.1	28.3	26.4	24.3
Feed more	31.6	32.3	34.0	29.4
Giving liquid to a sick child: percent who said…				
More liquids	22.6	25.1	17.8	24.2

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

4.4 Infant and Young Child Feeding (IYCF) Practices

Breastfeeding practices - Breastfeeding is near universal in this population and 40% of the caregivers included in the baseline survey reported that they had initiated breastfeeding within the first hour of birth, the recommended practice **(Table 4.11)**. Predominant breastfeeding of

children less than 6 months of age is practiced by nearly all of the caregivers however, exclusive breastfeeding is far less common with only 21% of the children < 6 months of age having been exclusively breastfed in the 24 hours prior to participating in the survey. Among the small sample of 12 month old children we had, continued breastfeeding at 12 months of age was also the norm among this population. About half of the children included in the baseline study had age appropriate breastfeeding practices which for children less than 6 months of age means that they were exclusively breastfed in the previous 24 hours and for children 6-12 months of age it means that they received both breast milk and some semi-solid or solid food. The use of bottles by caregivers in the villages included in the study is extremely low only about 1% of the total sample reported having used a bottle in the previous 24 hours.

There were very few statistically significant differences between the villages assigned to the different treatment groups. Children in the control villages were more likely to have begun breastfeeding within the first hour of birth and to have either been exclusively breastfed if less than 6 months of age or to have received breast milk and some semi-solid or solid food in the previous 24 hours. Children less than 6 months of age in the village committee villages were more likely to be exclusively breastfed compared to children in the other two treatment groups. There were no statistically significant differences between the treatment groups for the other indicators.

Complementary feeding practices – The results from the complementary feeding indicators reveal a limited availability of food and that semi-solid and solid foods are not commonly given to children between the ages of 6-12 months in these villages. Only 13% of the children between the ages of 6 and 8 months had received semi-solid or solid food in the previous 24 hours, instead receiving either breast milk alone or breast milk along with other liquids **(Table 4.11)**. Among children 6-12 months of age, the dietary diversity scores were extremely low with a mean of 0.2 (0.5) for children 6-9 months of age and 0.8 (1.1) for children 9-12 months of age (data not shown). Less than 2% of the children included in the study consumed the recommended minimum dietary diversity of 4 out of 7 food groups. And only 16% received the recommended number of meals in the previous 24 hours which for children 6-8 months of age was set at 2 and for children 9-12 months of age it was set at 3. The combination of these two indicators is used to assess whether or not children 6-12 months of age have an acceptable diet and among the children in this sample only 1% had an acceptable diet as described by the WHO (WHO 2008).

Diet diversity does increase with age as expected but the mean dietary diversity scores for children 9-12 months of age are still very low at 0.8 (1.1) out of a possible score of 7. The percentage of children who had the minimum recommended meals in the past 24 hours also seemingly increases with age with children 9-12 months of age more likely to meet the minimum requirements however this was still only reached for 23% of the children in the past 24 hours (data not shown).

There were no statistically significant differences between the treatment groups for any of the complementary feeding indicators.

Table 4.11 Infant and young child feeding practices (IYCF indicators)[a, b]

	Full sample		Treatment Group					
			Older Women		Village committee		Control	
	N	Percent	N	Percent	N	Percent	N	Percent
Breastfeeding indicators								
Child ever breastfed	1,723	99.8	498	99.8	509	100.0	716	99.6
Early initiation of breastfeeding (within 1 hour of birth)	1,662	40.1	487	37.0	465	33.1	710	46.9
Exclusive breastfeeding of children among children < 6 months of age	626	20.8	196	15.3	182	25.3	248	21.8
Predominant breastfeeding among children < 6 months of age	626	97.3	196	99.0	182	96.7	248	96.4
Continued breastfeeding	54	98.1	11	100.0	19	94.7	24	100.0
Age-appropriate breastfeeding	1,719	50.9	496	48.0	505	48.7	718	54.5
Bottle feeding	1,710	1.2	487	1.2	507	1.8	716	0.8
Complementary feeding indicators								
Introduction of solid, semi-solid or soft foods, 6-8 months	523	13.0	140	12.1	153	16.3	230	11.3
Consumption of iron-rich or iron-fortified foods	1,093	9.0	300	10.0	323	9.0	470	8.3
Minimum meal frequency	1,083	16.0	299	17.7	314	17.8	470	13.6
Minimum dietary diversity (≥ 4 food groups)	1,093	1.6	300	2.3	323	1.5	470	1.1
Minimum acceptable diet	1,083	1.1	299	1.7	314	1.0	470	0.9

[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.

4.5 Child Nutritional Status

The average age of children in the sample was 6.9 months of age and half were boys.

Hemoglobin concentration and anemia status - The average hemoglobin concentration (Hb) among children 3-12 months of age was 9.0 g/L **(Table 4.12)**. The vast majority of these children were anemic (Hb < 11.0 g/L) (88%) and 11% were severely anemic (Hb < 7.0 g/L). The prevalence of anemia and severe anemia increased with age. Among children 3-6 months of age the prevalence of anemia was 86% compared to 92% among children 9-12 months of age and the prevalence of severe anemia was 11% among children 3-6 months of age compared to 15% among children 9-12 months of age (data not shown). There were no significant differences between male and female children in the average hemoglobin concentration or in the prevalence of anemia or severe anemia.

There were however significant differences between the intervention groups in the average hemoglobin concentration and in the prevalence of severe anemia; children in the control group had a higher average hemoglobin concentration than those in either of the treatment groups (9.1 g/L versus 8.9 g/L) and had a lower prevalence of severe anemia compared to the two treatment groups (8.4% in the control group versus 13.6 and 13.7 % in the two treatment groups).

Anthropometric measures - Growth faltering was common in this sample; the severity increased with age and was more pronounced among male children compared to female children. Across the sample the average height-for-age (HAZ), weight-for-age (WAZ) and weight-for-height Z-scores (WHZ) were -1.0, -1.4 and -1.0 respectively **(Table 4.12)**. The prevalence of stunting, underweight and wasting was 25%, 33% and 26%, respectively. The average HAZ dropped from an average of 0.2 among 3 month old children to -1.8 among 12 month old children **(Figure 4.1)**. WAZ declined in a similar fashion from -0.4 among 3 month old children to -1.6 among 12 month old children. WHZ also declined, although this was not quite as dramatic as the other two. Likewise the prevalence of stunting, underweight and wasting also increased with age. Among children 3-6 months of age the prevalence of stunting, underweight and wasting was 14%, 20% and 24% respectively compared to children in the 9-12 month age group who had a prevalence of stunting, underweight and wasting of 33%, 44% and 28% respectively **(Figure 4.2)**. Male children had significantly lower HAZ, WAZ and WHZ scores and were more likely to be stunted, underweight and wasted. For example, 30% of male children were stunted as compared to 21% of female children and 40% were underweight compared to 27% of female children **(Table 4.12)**.

There were no statistically significant differences in the HAZ, WHZ, or WAZ scores or in the prevalence of stunting or underweight among children between the different groups. However, children in the control villages were less likely to be wasted than children in the two treatment groups (prevalence = 22% for children in the control group compared to 27 and 29% in the older women and village committee groups, respectively).

Table 4.12 Child nutritional status among children 3-12 months of age included in the baseline survey[a]

	Children 3-12 months of age					
				Treatment Group		
	Full sample			Older Women	Village Committee	Control
	All	Boys	Girls	All	All	All
	N= 1749	N=876	N=873	N=504	N=515	N=730
Age (months)	6.9	7.0	6.9	6.8	6.9	7.0
	(2.7)	(2.7)	(2.7)	(2.7)	(2.8)	(2.7)
Sex (percent male)	49.9	-	-	50.6	50.7	48.9
Height-for-age Z-score	-1.0	-1.2	-0.8*	-0.9	-1.1	-1.1
	(1.7)	(1.7)	(1.7)	(1.8)	(1.7)	(1.7)
Stunted (HAZ < -2 SD)	25.3	30.0	20.5*	25.8	26.0	24.4
Weight-for-age Z-score	-1.4	-1.6	-1.2*	-1.3	-1.4	-1.4
	(1.5)	(1.5)	(1.5)	(1.6)	(1.6)	(1.5)
Underweight (WAZ < -2 SD)	33.1	39.7	26.5*	31.5	34.4	33.3
Weight-for-height Z-score	-1.0	-1.1	-0.9*	-1.0	-1.1	-0.9
	(1.8)	(1.8)	(1.8)	(1.8)	(1.9)	(1.7)
Wasted (WHZ < -2 SD)	25.6	28.1	23.1*	27.0	28.9	22.3
Hemoglobin (Hb) (g/L)	9.0	8.9	9.0	8.9	8.9	9.1
	(1.8)	(1.7)	(1.7)	(1.7)	(1.8)	(1.6)
Anemic (Hb < 11.0 g/L)	88.0	88.5	87.5	89.1	86.6	88.2
Severely anemic (Hb <7.0 g/L)	11.4	11.9	11.0	13.7	13.6	8.4

Note: ***** difference between males and females are statistically significant at the 5 percent significance level (two sample t-test or chi-square test).

[a] Values are mean (SD) or percent; bolded numbers mean that there are significant differences between the treatment groups (health committee, grandmothers and control).

Figure 4.1 Mean Z-scores for height-for-age, weight-for-age, and weight-for-height

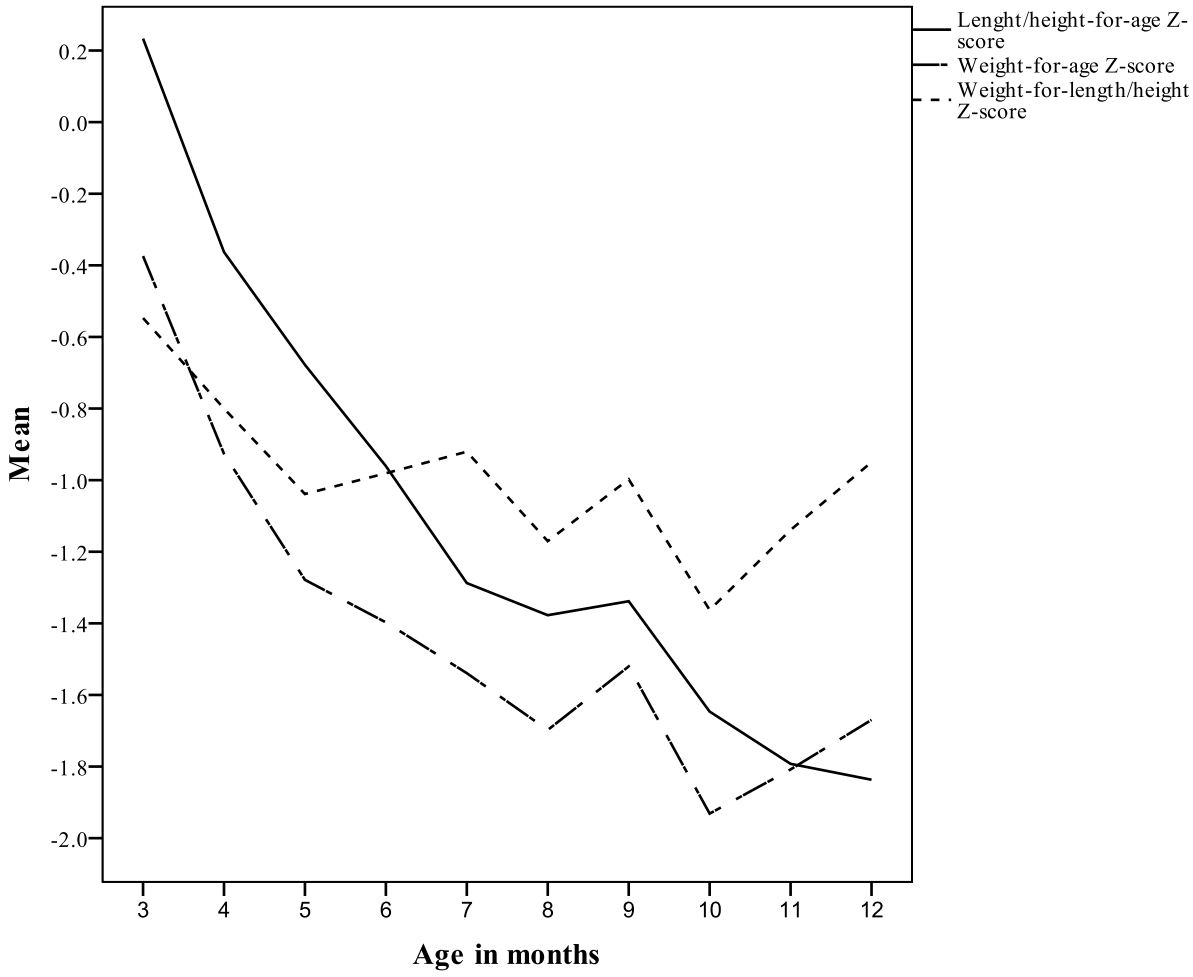
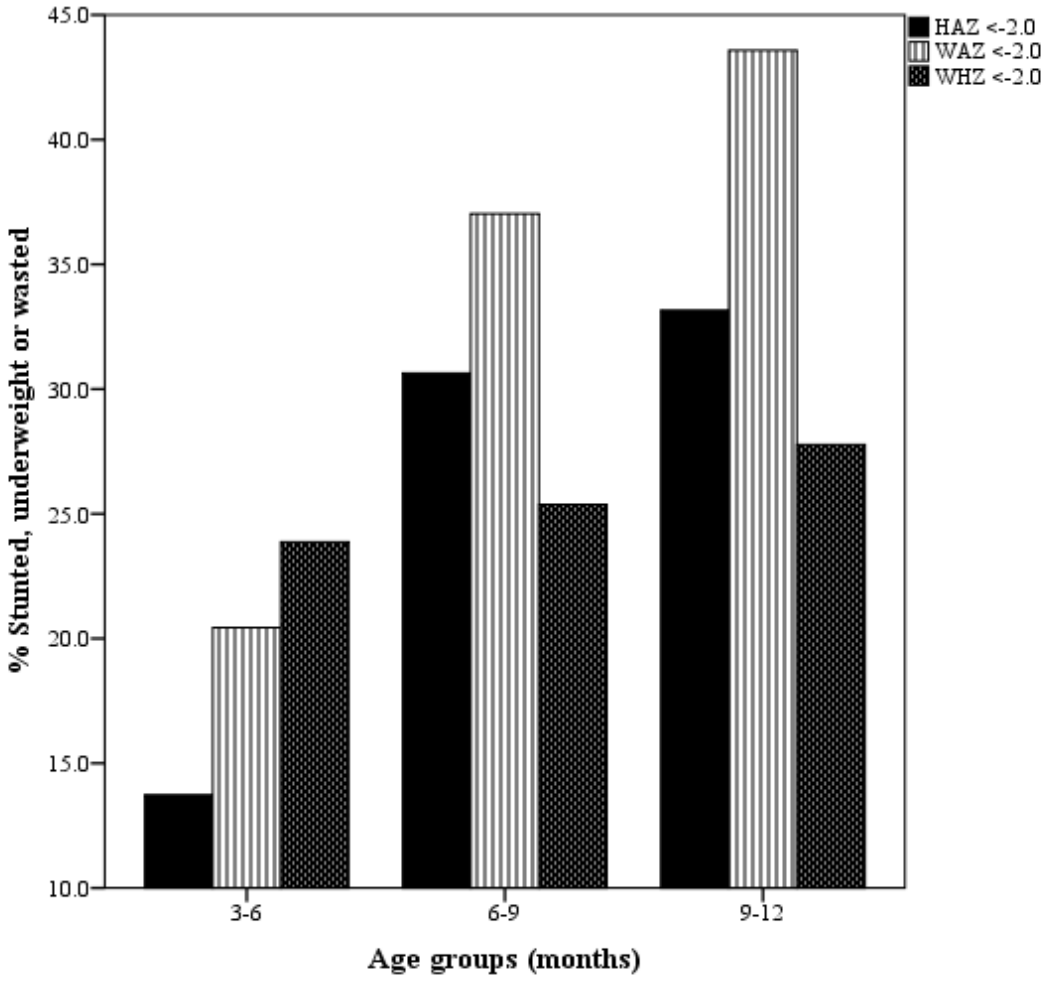


Figure 4.2 Prevalence of stunting, underweight, and wasting, by age



5. Discussion

5.1 Summary of Key Findings

Household demographics, asset holdings, consumption and agricultural production

Household demographics are relatively similar across the three treatment groups. Household size ranges between 7-7.5 household members with the village committee treatment having the lowest household sizes among the three groups found in the sample. Education levels are relative similar across the three groups, but quite low. This suggests that due to low levels of human capital, assimilation of advanced health and agricultural practices may be slower than in more highly educated populations.

One consistency across the two treatment groups and control group is the relative similarity of counts of assets either defined as household durables or livestock among women and men, but larger differences between groups with respect to the value of these assets. Households in the control group have larger asset holdings in terms of value of assets than in either of the treatment groups. This pattern is also consistent in comparisons of household expenditure patterns. Total household expenditure per capita is slightly higher in the control group. Disaggregated data by food group also reveal differences in the diet patterns of households among the three groups. Much of this variation is likely due to the selection of a few larger villages in the control group. When the final analysis of the data is conducted, the influence of these villages can be assessed by estimating impact estimates with and without their inclusion.

Agricultural production across the three groups within the sample is relatively similar with the exception of some differences in crop choice by group. Apart from differences in crop choice, the number of hectares cultivated, the number of plots cultivated and the input utilization rates used on these plots is homogenous across the groups.

Primary caregiver knowledge of nutrition and health related practices

Caregiver knowledge related to optimal IYCF and care practices was limited among the participants in the baseline study. Although the majority of caregivers knew that children should be given colostrum, less than a quarter of the participants did not think you should give liquids other than breast milk to children less than 6 months of age. In addition, across the sample caregivers stated on average that children should start receiving liquids at about 3 months of age as opposed to the recommended 6 months of age and should begin receiving foods on at 7 months of age on average, where again the recommendation is for 6 months of age.

Although the vast majority of caregivers reported that children should be taken to a medical center to treat diarrhea, few mentioned that they should provide ORS to a child suffering from diarrhea. Giving traditional medicines was more commonly mentioned especially among caregivers in the villages assigned to the older women's group.

Infant and young child feeding and care practices

The results from the IYCF practices are alarming – especially in terms of complementary feeding practices. Although breastfeeding is near universal, only 21% of children less than 6 months of age were exclusively breastfed in the previous 24 hours. In addition, among children older than 6 months of age there appears to be a heavy reliance on breast milk and other liquids which do not provide a sufficient amount of energy or nutrients to children during this critical developmental stage.

The vast majority of caregivers included in the baseline survey did not practice optimal complementary feeding practices. The results indicated that in general complementary foods are not introduced until after 6 months of age and once introduced the variety of foods and micronutrient-rich foods consumed appears to be very limited.

Children in these villages are a high risk for becoming malnourished and remaining malnourished by their feeding practices alone. The low prevalence of exclusive breastfeeding coupled with the late introduction of complementary foods and heavy reliance on breast milk and other liquids for children over 6 months of age places these children at a very high risk of becoming malnourished. These two practices limit the chance of children meeting their nutrient needs. In addition, the early introduction of liquids other than breast milk increase children's exposure to illness which can also contribute to the development of malnutrition or exacerbate existing nutrition related problems.

Child nutrition status

The patterns of growth faltering seen in this population are similar to those seen in other populations at-risk for nutritional deficiencies where children's growth quickly begins faltering as children get older (Victora 2010). In this population, the growth faltering began as early as 3 months of age with increasing deficits in HAZ, WAZ, and WHZ seen with increasing age. The prevalence of wasting is extremely high in this population compared to populations from other developing countries. However, the prevalence is similar to that reported in other surveys done in Burkina among rural populations with low levels of education which is a similar to the population included in this study. The greater deficit of growth faltering among boys compared to girls is striking. Among children less than 6 months of age are already apparent with 13% of children either stunted or underweight or both and 15% wasted and among children 6-11 months of age the deficits in growth become even more apparent with 24% of children stunted, 27% underweight and 19% wasted.

Although anemia is common in populations where malaria is endemic and where access to high quality foods, especially animal source foods is limited, the near universal prevalence of anemia among children 3-12 months of age and the relatively high prevalence of severe anemia among the children included in this sample is also alarming. These high rates are likely due to a combination of illness, lack of access to adequate health care and inadequate access to high quality foods.

Differences between treatment groups

Many differences were found between the different treatment groups. Although there were variations across some of the indicators, there did appear to be some systematically consistent differences across the treatment groups. Overall the control group appears to be better off than either of the two intervention groups and to possibly have more access to more health services. Greater access to health care could contribute to better nutritional outcomes both in terms of treatments provided for illnesses as well as through education provided through visiting health care facilities whether it is provided directly (through trainings) or indirectly (through things such as posters). Caregivers in the villages assigned to the control group were more likely to have accurate knowledge of optimal IYCF and care practices and to follow some of these key practices such as initiating breastfeeding within the first hour after birth and breast feeding their children as appropriate for their age (i.e. exclusive for children less than 6 months of age and breast milk with semi-solid or solid foods for children older than 6 months of age) In addition, the prevalence of wasting and severe anemia, the two most severe nutritional status indicators included in this study, were lower among children in the control group as compared to the two intervention groups. This pattern of differences makes sense and indicates that there are likely real differences between the villages included in these different treatment groups. These differences will need to be taken into account in the analysis of the data from the final survey.

5.2. Recommendations

Primary caregiver knowledge

Increasing knowledge related to optimal IYCF and care practices could have a significant impact on children's growth, health and development if both the knowledge is gained and the practices implemented. Less than half of the participants knew each of the key practices assessed in this study, which means there is a great deal of room for improvement in increasing knowledge regarding some of these key behaviors.

HKI's BCC strategy is designed to address these key behaviors and should likely focus on messages related to the importance of exclusive breastfeeding (for future generations) and on optimal complementary feeding practices as well as key behaviors related to preventing and treating common illnesses such as diarrhea and nutrition-related problems such as growth faltering and anemia. Since breastfeeding is widely practiced and the majority of women seem to know that colostrums should be given these knowledge related messages could possibly be emphasized less than some of the others related to the topics mentioned above.

Primary caregiver IYCF practices

As mentioned above the results from the IYCF practice indicators are alarming and require immediate attention. However, they are not surprising given the related knowledge of the caregivers. Although some improvements could be seen in increasing adherence to optimal IYCF practices through increased knowledge alone it will be important for HKI to focus on not only increasing knowledge but also on increasing the implementation and adherence to best practices.

In addition to increasing knowledge and adherence to best practices the E-HFP program is in a unique position to address another common limiting factor to adhering to optimal IYCF practices which is resource constraints. Through the agriculture portion of the E-HFP program, participants in the program will ideally have increased access to high quality foods including animal source foods. The availability of these foods at the village and household level may significantly improve children's dietary diversity scores as well as consumption of micronutrient rich foods such as vitamin A rich foods. The combination of this increased availability of high quality foods coupled with a well-designed BCC strategy to increase caregiver knowledge of optimal IYCF practices has the potential to significantly impact the health and growth of children in these communities, including those of future generations. It will be important to examine these spillover effects in the final survey in addition to the impact on the targeted cohort of children.

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