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**FROM RESEARCH TO PROGRAM DESIGN:
USE OF FORMATIVE RESEARCH IN HAITI TO DEVELOP
A BEHAVIOR CHANGE COMMUNICATION PROGRAM
TO PREVENT MALNUTRITION**

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Abstract

This paper summarizes findings from a formative research study conducted in Haiti to develop a behavior change communication (BCC) strategy to improve infant and child feeding practices and to reduce childhood malnutrition. It describes the methodology used and the tools developed to facilitate decisionmaking and effective use of formative research for program planning. The study is part of a larger research project carried out by the International Food Policy Research Institute (IFPRI) and Cornell University in collaboration with World Vision-Haiti, a private voluntary organization responsible for the implementation of integrated health and nutrition programs that include food donations.

The study used formative research methods that included individual and group interviews, food-rating exercises, and participatory recipe trials. The aims of the study were to (1) study current infant and young child feeding practices in the Central Plateau of Haiti, (2) identify individual, household, and community factors that may facilitate or constrain adoption of recommended behaviors, and (3) use the information from the formative research to prioritize behaviors and design an effective BCC strategy.

The study revealed some nonoptimal infant and young child feeding practices in this part of rural Haiti, such as low rates of exclusive breastfeeding, early introduction of nutrient-poor gruels, and the scarcity of nutrient-dense foods such as animal products in the diet. A number of constraints were also identified that may limit the ability of families to engage in optimal feeding practices. These include the early resumption of work outside the home by women, which is driven by economic necessity and results in frequent and sometimes long separations of the mother from her young infant. The lack of time to prepare special complementary foods for the child, the perception that 12-month-old infants are ready to consume the family diet, and the low availability of micronutrient-rich foods (animal-source foods in particular) are additional constraints on poor families to achieving optimal child feeding practices.

The data also highlighted some facilitating factors that could be used to design locally relevant and powerful communication messages. The few mothers who reported having exclusively breastfed their infants, for example, emphasized that this practice improved their infants' health and reduced health-care costs. Similarly, the absence of cultural restrictions regarding feeding animal-source foods to infants and young children, and the knowledge among some mothers that these foods are good for children, are positive factors likely to facilitate behavior change related to these practices. The recipe trials also provided valuable insights regarding feasible, affordable, and acceptable recipes for enriched complementary foods that could be promoted through the BCC intervention.

To simplify interpretation of the findings, we organized the information gathered into a *decision tool*. This tool consists of a matrix containing the following elements:

1. goal to achieve,
2. practices to promote to achieve this goal,
3. current practices in the population studied,
4. facilitating conditions for behavior change, and
5. issues that may affect the capacity for behavior change (e.g., potential constraints).

A second, complementary matrix summarizes the constraints and facilitating factors identified for the different practices and includes columns to identify programmatic options (either within or outside of the current program context) to alleviate some of these constraints or to optimize use of facilitating factors in promoting behavior change.

The decision tool was useful, because it helped structure the large amount of information gathered and permitted its presentation in a systematic, clear, easy-to-grasp manner. The tool also proved valuable in discussions related to program planning with World Vision-Haiti staff at all levels, in developing programmatic options within the current program structure, and providing suggestions for additional supporting program activities.

Contents

Abbreviations and Acronyms	vii
Acknowledgments.....	viii
1. Introduction.....	1
Background.....	1
Objectives of the Formative Research	2
Structure of the Report.....	2
2. Rationale for a BCC Strategy to Reduce Child Malnutrition	3
3. Methods.....	7
Topics Addressed.....	7
Data Collection Methods	10
Study Communities.....	14
Data Analysis	15
4. Results.....	15
Infant and Young Child Feeding Recommendations.....	16
Findings Related to Infant Feeding and Care	16
Breastfeeding	17
Complementary Feeding.....	22
Feeding During Illness.....	30
Maternal Diet During Lactation.....	33
Maternal Work and Alternate Childcare Use.....	34
Follow-Up Research Results.....	38
5. Results of Recipe Trials	46
Complementary Foods Currently Fed to Infants and Young Children.....	47
Modified Recipes Developed During the Recipe Trials	49
Observations about Recipe Trial Participants.....	51
Nutritional Quality of the Complementary Foods	52
Estimated Cost of Using Animal Source Foods to Fill the Iron and Zinc Gaps.....	58
Sodium Content of Complementary Foods.....	61

6. From Research to Action: Development and Use of a Decision Tool for Program Planning	62
Stage 1: A Tool to Organize Formative Research Findings and Facilitate Decisionmaking	62
Stage 2: From Formative Research to Program Development—A Tool to Plan Programmatic Actions	70
7. Conclusions	75
Appendix 1: Summary of Guiding Principles for Complementary Feeding of the Breastfed Child	77
Appendix 2: Estimation of Amounts of Beef and Beef Liver Needed to Close the Iron Gap for Infants Age 6-8 Months Who Are Fed Enriched Gruels	81
References	83

Tables

1 Overview of topics, methods, and communities where data were collected	8
2 Follow-up research topics, methods, and communities where data were collected	10
3 Communities and zones included in this study	14
4 Types of liquids and foods, by age of introduction	23
5 Amounts of meat and liver available for a set price in local markets in Central Plateau	43
6 Summary of recipes tested through recipe trials	50
7 Summary of energy densities of currently fed complementary foods and of modified recipes	54
8 Summary of the nutrient densities of currently fed complementary foods and of modified recipes (only for 6–8-month-olds)	57
9 Amounts of meat and liver that would need to be consumed by children ages 6-8 months to complement selected gruels fed twice a day	59

10	Infant and child feeding practices in Haiti compared to best practices, and constraints and opportunities for behavior change in Central Plateau.....	63
11	Identification of programmatic options to address the constraints to infant feeding and to support facilitating factors	71

Appendix 2 Tables

12	Requirements for absorbable iron.....	81
13	Amounts of beef and beef liver needed to close the iron gap.....	82

Box

1	Best-practice feeding behaviors—from a psychosocial perspective	69
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Abbreviations and Acronyms

BCC	Behavior change communication
BF	Breastfeeding
CF	Complementary feeding
CSB	Corn-soy blend
EBF	Exclusive breastfeeding
FANTA	Food and Nutrition Technical Assistance
IFPRI	International Food Policy Research Institute
PVO	Private voluntary organization
SD	Standard deviation
SFB	Soy-fortified bulgur
TIPS	Trials of improved practices
USAID	U.S. Agency for International Development
WSB	Wheat-soy blend
WFP	World Food Programme
WV	World Vision

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1. Introduction

Background

This paper describes the formative research process undertaken in Haiti to assist World Vision in the development of a behavior change communication (BCC) program aimed at reducing childhood malnutrition in the Central Plateau. The research is part of a larger evaluation being conducted by the International Food Policy Research Institute (IFPRI) and Cornell University in collaboration with World Vision-Haiti, to compare two models for delivering integrated food and nutrition programs with a take-home food ration component. The two models, which will be implemented by World Vision-Haiti, are (1) the traditional *recuperative* approach, whereby children under 5 years of age are targeted to receive food supplements, nutrition counseling, and follow up when they are identified as malnourished (i.e., their weight-for-age is below 2 SD of the median of the reference population), and (2) the *preventive* approach, which targets food supplements and other preventive interventions to all children under 2 years of age. The aim of this approach is to intervene before growth retardation occurs, and thus to prevent, rather than cure, malnutrition.

As part of the project, the IFPRI-Cornell team is assisting World Vision-Haiti in designing and implementing a fully developed preventive model and in strengthening their current recuperative program model. This involves the development of a BCC strategy, which will be implemented by World Vision-Haiti, with technical assistance for the design and development from the IFPRI-Cornell team. Within this larger goal, the formative research activities were intended to produce insights and information to design an effective BCC strategy.

The first step in this process, initiated in November–December 2001 and reported on previously (Menon et al. 2001), was to gather information on existing nutrition and health education models currently used in Haiti. Following this, a rapid qualitative study was conducted in January 2002 (Menon et al. 2002) to gather information on general

patterns of infant and child feeding practices. This was used to guide the development of the baseline quantitative survey for the evaluation and design of the formative research to develop the BCC strategy.

Objectives of the Formative Research

The overall purpose of the formative research was to augment the findings of the previous qualitative studies and to provide a strong foundation upon which to build the BCC program. Because the preventive model being developed targets 0–24-month-old children, the formative research activities were designed to obtain more in-depth information on children in this age range and to explore the feeding and caring practices of Haitian mothers during this critical period.

The objectives of this study were to

1. provide a knowledge base about infant and young child feeding and care that would serve as the foundation for the BCC strategy,
2. develop enriched complementary foods to be promoted in the BCC strategy, using locally available and affordable ingredients, and
3. identify possible avenues and delivery systems for inserting preventive BCC activities into the current structure of World Vision program activities in the Central Plateau of Haiti.

This report describes approaches used and findings related to the first two objectives but does not elaborate on the third one. Findings related to the third objective and further details on the findings reported here can be found in Menon et al. (2003).

Structure of the Report

The report is structured as follows. The rationale for a BCC strategy is described in Section 2. The topics addressed in the current formative research, the methods used to gather the information, and the main characteristics of the communities included in the

study are described in Section 3. Findings from the individual and group interviews on child feeding and care patterns, and on the resources and constraints to optimal caregiving practices are presented in Section 4. Section 5 presents the results of the group recipe trials carried out in the communities to develop enriched complementary foods to be promoted in the BCC strategy. Finally, the document presents the decision tool developed by the research team to summarize the information gathered through the formative research and to facilitate the translation of research findings into action. Examples are provided of how to use the decision tool for a variety of purposes such as to

1. select priority behaviors to be addressed in the BCC program,
2. design a BCC strategy that is sensitive to the constraints and facilitating factors identified through the research, and
3. identify other potential complementary interventions that may help alleviate some of the constraints identified, which may require additional inputs or resources.

2. Rationale for a BCC Strategy to Reduce Child Malnutrition

In children, positive changes in health and nutrition are manifested in many forms, including improved growth and development and reduced morbidity and mortality. Each of these outcomes is the result of complex interactions between familial caregiving behaviors and the biological underpinnings of health and nutrition. For example, to protect a child from a vaccine-preventable disease, such as measles, the family must know when and where to take the child for the vaccination and have the resources to take these actions; and the vaccine itself must be safe and effective. In other words, the availability of the vaccine alone does not prevent the disease.

Similarly, to enable children to grow normally, there are many parental caregiving behaviors related to food that are essential to ensuring adequate nutritional intake: obtaining and selecting foods that meet nutritional requirements, preparing them safely and in a form that is appropriate for the child's age, and feeding them in a manner that

encourages adequate intake. To engage in these critical caregiving behaviors, parents need access to the foods their children require; access to fuel, water, and other materials to prepare and preserve these foods; and time and physical energy to carry out the activities. They also need knowledge. These are essential underpinnings of nutrition and health-giving behaviors, and the prerequisites for child health and well-being. Because caregiving behaviors are the links between resources, knowledge, and child health, programs that seek to improve child health and nutrition must, by definition, change caregiving behaviors.

Programs that aim to improve child outcomes by improving childcare behaviors are collectively referred to as BCC programs. A recent review of complementary feeding programs provides evidence that BCC programs can be effective in reducing child malnutrition in a variety of contexts (Caulfield, Huffman, and Piwoz 1999). A more recent review of nutrition programs addressing a variety of nutritional issues also indicates that BCC programs are slightly more cost-effective, in terms of cost per lives saved, than supplementation, and much more cost-effective than fortification (ACC/SCN 2001). The review also provides a basis for understanding the various factors that influence the success of BCC programs to achieve their goals. The authors found that the success of BCC programs depends not only on the design, targeting, and outreach of the program, but also on contextual factors, such as community involvement and political commitment.

The successful programs reviewed by Caulfield, Huffman, and Piwoz (1999) had used very similar approaches to program design. These approaches all included a number of stages of formative research, including a review of existing materials related to infant feeding in the program areas, ethnographic research to understand current infant feeding behaviors and their motivations, an assessment of current complementary foods, and recipe trials to develop enriched complementary foods. Additionally the development of program strategies in all cases used a comprehensive approach, which took into account contextual facilitating factors and the findings from the formative research. These programs showed substantial improvements in caregiver knowledge and recall of

program messages, increased intakes of complementary foods, and improvements in child nutritional status that were similar to improvements seen from food supplementation studies. Even taking the problematic design of some of the program evaluations into account, the authors estimated that BCC programs could improve child nutritional status by as much as 0.1–0.4 Z-scores.

Some of the features of the programs that could have contributed to these successes are likely to be their attention to the local context within which the program was to operate, an in-depth understanding of infant feeding practices was based on solid formative research, and a program strategy that used a comprehensive approach in its design and implementation. Almost all the programs reviewed, for instance, used very clear key messages that were age-appropriate and action-oriented and that would allow caregivers to make easy changes in infant feeding adapted to the child's stage of development. The programs also used multiple approaches to reach caregivers, usually combinations of mass media and individual advice and counseling. In addition, they used a variety of communications methods, such as radio spots, cooking demonstrations, storytelling and drama, and all of these were accompanied by appropriate visual communications materials such as posters, counseling cards, and take-home cards on infant feeding.

The success of BCC programs also depends on consideration factors that facilitate or impede the achievement of the expected change in behavior. A large body of empirical epidemiological research and strong theoretical models on the determinants of nutrition and health outcomes support the proposition that improving nutritional conditions through behavior change in populations requires consideration of factors at multiple levels. Recent conceptual frameworks on behavior change related to food and physical activity in the United States also suggest that individual behavior is driven by a variety of factors at multiple levels (Booth et al. 2001; Wetter et al. 2001). Examples of factors that are important influences at the core individual level (also labeled the “psychobiological” level) include physiology, hierarchy of needs, and genetics. At the cultural level, factors such as motivations, beliefs, values, habits, and life experiences are

key influences, while at the social level, there are such factors as social roles, life stage, socioeconomic status, and educational attainment. A variety of environmental and other factors also enable individuals to make choices, including social trends, seasonality, convenience, cost, and time. Clearly, developing a program to influence change—first at the individual level and gradually at a wider societal level—will require consideration of these multiple levels. In particular, addressing one level of factors alone is not sufficient to bring about significant improvements in health and nutrition in conditions of poverty and underdevelopment.

The preventive child health program to be developed in the current research aims to provide families with a resource (donated food commodities), and, at the same time, provide them with a knowledge base that can support behavior change to *prevent* child malnutrition. To achieve the goal of transforming both resources and knowledge into improved childcare practices and child health, other contextual factors should be acknowledged. In addition, other resources will be needed to ensure that caregivers and families are able to provide adequate care to their children, including caregivers' time, mental and physical health, social support, and a minimum level of economic resources (Engle, Menon, and Haddad 1999). Although some of these issues cannot be directly addressed through the current preventive BCC program model alone, they are factors that will be acknowledged and investigated further in the program operations research and the overall evaluation of this program in Haiti.

Thus, the research presented in this paper describes some of the preliminary stages of formative research that were identified as critical in the review: ethnographic research on infant feeding and its determinants, the assessment of currently used complementary foods, and recipe trials to develop modified recipes for complementary foods that can be promoted through a BCC program.

3. Methods

This section describes the topics addressed in the present phase of formative research, the methods used to examine these topics, and the communities included in the study.

Topics Addressed

The selection of topics to be included in the formative research was based on preliminary findings from a previous qualitative study (described in Menon et al. 2002), and the information gaps that needed to be filled to guide the development of the preventive BCC program. The goal was to carry out in-depth research on the underlying determinants and motivations of the patterns identified and the extent of their generalizability. Table 1 presents the themes explored in the present research and summarizes the methods used to study each. The topics addressed are summarized below.

1. *Breastfeeding*. The formative research assessed current breastfeeding practices and explored the constraints to exclusively breastfeeding infants up to the recommended 6 months of age (Dewey and Brown 2003; PAHO/WHO 2003). Discussions with mothers who exclusively breastfed were undertaken to identify culturally appealing arguments that could be used in the BCC program to motivate other mothers to adopt exclusive breastfeeding. Reactions to the idea of expressing breast milk were also investigated.
2. *Complementary feeding practices*. In-depth information was gathered on patterns of introduction of complementary foods, mode of feeding, meal patterns, and information on food prescriptions and proscriptions at different ages. In other words, in addition to exploring *what* children are fed, information was gathered on *when*, *where*, and *how* children are fed (see Section 4). Further, information was gathered on the perceptions of caregivers on the stages of development of

infants; this helped the team understand how these perceptions influenced caregiving behaviors.

Table 1—Overview of topics, methods, and communities where data were collected

No.	Topic	Methods	Communities where data were collected
1.	BREASTFEEDING ➤ Exclusive breastfeeding (when, where, why) ➤ Expression of breast milk	➤ 4 interviews with positive-deviant mothers ➤ 2 group interviews with mothers of children 0–6 months old ➤ Other group interviews ○ 4 with mothers ○ 1 with mothers and fathers ○ 1 with grandmothers ➤ Individual interviews ○ 1 mother	<i>Hinche</i> : Bassin Zim, Trois Bois Pin, Pablocal, Madame Brun, Doco <i>Thomonde</i> : Tierra Muscadi <i>Lascahobas</i> : Savane Perdue, Fond Pierre, Casse
2.	COMPLEMENTARY FEEDING ➤ Pattern of introduction and mode of feeding (what, why, when, and who) ➤ Food prescriptions and proscriptions ➤ Meal patterns	➤ Individual interviews ○ 4 mothers ➤ Group interviews ○ 7 with mothers ○ 2 with grandmothers	<i>Hinche</i> : Bassin Zim, Coloroche, Trois Bois Pin, Madame Brun <i>Thomonde</i> : Tierra Muscadi <i>Lascahobas</i> : Savane Perdue, Fond Pierre, Casse
3.	FEEDING DURING ILLNESS ➤ Types of diarrhea ➤ Feeding and home treatment for each type of diarrhea and stomachache	➤ Group interviews ○ 3 with mothers ○ 1 with grandmothers ➤ Individual interviews ○ 2 mothers	<i>Hinche</i> : Pablocal, Bassin Zim <i>Lascahobas</i> : Casse, Fond Pierre
4.	MATERNAL DIET DURING LACTATION ➤ To assess likelihood of dietary deficits, which could affect lactation performance and maternal nutrition and health	➤ Group interviews ○ 2 with mothers ○ 1 with grandmothers	<i>Hinche</i> : Bassin Zim <i>Lascahobas</i> : Savane Perdue
5.	MATERNAL WORK AND ALTERNATIVE CHILDCARE USE ➤ Maternal work patterns (frequency, duration of absence) ➤ Organization of childcare substitutes ➤ Role of fathers	➤ Individual interviews ○ 3 mothers ➤ Group interviews ○ 4 with mothers ○ 1 with mothers and fathers	<i>Hinche</i> : Bassin Zim, Coloroche, Doco <i>Thomonde</i> : Tierra Muscadi <i>Lascahobas</i> : Fond Pierre
6.	RECIPE TRIALS ➤ To develop new and enriched complementary foods (recipes, mode of feeding, pattern of introduction)	➤ Group recipe trials in three stages ○ 3 initial group discussions ○ 3 recipe trials with tasting and discussion ○ 3 follow-up discussions to assess feasibility	<i>Hinche</i> : Bassin Zim, Trois Bois Pin <i>Thomonde</i> : Tierra Muscadi

3. *Feeding during illness.* Information was gathered on the types of diarrhea identified in the population and on feeding during diarrhea and other related illnesses.
4. *Maternal diet during lactation.* Information was gathered on maternal dietary restrictions during lactation to assess what these restrictions are, whether they are widely adhered to, and whether they are likely to result in dietary deficits among lactating women.

5. *Maternal work and alternative childcare use.* A potentially important constraint to optimal child feeding practices is the absence of the mother from home. Information was therefore collected on maternal work patterns, the frequency and duration of separations from their young children, the type of childcare substitutes used, and the overall level of maternal control over childcare responsibilities.
6. *Recipe trials.* Recipe trials were carried out in a number of communities to develop new and enriched complementary foods that would have a greater energy and nutrient density using affordable, locally available ingredients and traditional recipes.

Following the formative research and recipe trials, three workshops were held in Haiti to present the results of the formative research to various stakeholders. These workshops generated issues for follow-up research based on the findings of the larger formative research study. A summary of the topics explored through the follow-up research is presented below. (Details of the methods used and communities involved are presented in Table 2.)

1. Availability and cost of iodized salt in local markets;
2. Availability, use, and perceptions of the following animal-source foods for feeding infants and young children:
 - a. Goat milk,
 - b. Chicken, red meat, and liver,
 - c. Dried fish: soaking to desalinate prior to use and to allow using larger amounts without making the preparation too salty;
3. Local methods to keep liquids cool (that could be adapted to preserve expressed breast milk);
4. Perceptions of the special needs of infants between 12 and 24 months.

Table 2—Follow-up research topics, methods, and communities where data were collected

No.	Topic	Methods used	Communities where data were collected
1.	➤ Availability and cost of iodized salt	➤ Visits to local markets and interactions with local vendors	<i>Hinche</i> : Madame Brun (Ti-Casse); Pablocal (Merehil); <i>Hinche</i> <i>Thomonde</i> : Thomonde
2.	➤ Availability, use, and perceptions regarding the following animal-source foods for feeding infants and young children: ○ Goat milk ○ Chicken, red meat, and liver ○ Dried fish: soaking to desalinate prior to use	➤ 4 group interviews with mothers	<i>Hinche</i> : Moruque/Rode <i>Thomonde</i> : Tierra Muscadi <i>Hinche</i> : Moruque/Rode <i>Thomonde</i> : Tierra Muscadi Market visits in <i>Hinche</i> , Merehil, Ti-Casse, Thomonde
3.	➤ Local methods to keep liquids cool (that could be adapted to preserve expressed breast milk)	➤ 4 group interviews with mothers	<i>Hinche</i> : Bassin Zim Moruque/Rode, Marmont <i>Thomonde</i> : Tierra Muscadi
4.	➤ Special needs of children 12–24 months old (possible motivating factors that can be used to ensure that infants 12–24 receive adequate attention and care)	➤ 2 group interviews with mothers ➤ 2 individual interviews	<i>Hinche</i> : Bassin Zim. Moruque/Rode, Marmont <i>Thomonde</i> : Tierra Muscadi

Data Collection Methods

The methods used in this phase of formative research were based on the World Health Organization (WHO) Focused Ethnographic Study methodology (WHO 1994) and the *Designing by Dialogue* manual (Dickin, Griffiths, and Piwoz 1997). Data collection methods were selected depending on the themes being explored and the types of participants.

The research was undertaken in the Central Plateau region of Haiti, where the BCC program will be implemented. Field-testing was done in May, and data collection occurred in May and July 2002. Ethical approval for the study activities was obtained from the Cornell University Commission on Human Subjects. Informed consent was obtained from all study participants before any data were collected.

Three methodological approaches were used:

1. semistructured interviews with individuals,
2. semistructured interviews with groups,
3. group recipe trials.

A brief description of the three methods is provided below.

Interview-Based Data Collection Techniques

Data collection relied primarily on interview-based methods, with all interviews conducted in Haitian Creole and translated into French. The interviews included both group and individual interviews. The group interviews were done primarily to obtain information on normative perceptions and prescriptions while individual interviews were done to obtain information on actual practices of mothers of young infants.¹ The interviews were based on a semistructured interview guide with extensive probing to explore issues in detail and to improve the reliability of the information. Extensive field notes were taken during the interviews and all notes were typed up the same day.

Individual interviews were conducted with mothers of infants ages 0–12 months, program personnel, and program beneficiaries. Group interviews were conducted with groups of mothers, fathers, grandmothers, and some mixed groups. Details about the methods and number of interviews used to explore each theme are presented in Table 1.

In addition to interviews, a food-rating exercise obtained detailed information on perceptions related to foods that were appropriate for children at different ages. Photographs of widely consumed foods were numbered and laminated for use as “food cards.” The cards were then used in the group interviews as the basis for starting a discussion on the appropriateness of various foods for the health of young infants and children. Women chose or rejected foods and discussed their reasons for doing so. The food rating games were guided by questions and probes to explore ideas in detail.

Follow-Up Research Methods

The follow-up research was also conducted using group interview methods and recipe trials. There was insufficient time for more extensive or in-depth data collection.

¹ Group interviews were chosen over focus group discussions because of the exploratory nature of the research. Focus group discussions are by definition intended to obtain feedback on specific topics rather than explore perceptions related to different topics. Group interviews are more suitable for the latter objective.

However, the previously observed concurrence between the data from group and individual interviews in the formative research study reassured us that the group interviews would yield valuable data.

Group Recipe Trials to Develop New Recipes for Complementary Foods

Recipe trials are participatory cooking sessions conducted with small groups of mothers and their children with the aim of developing special complementary foods for infants and young children. Recipes are discussed, prepared, tasted, and evaluated for their acceptability, feasibility, and affordability for inclusion in the diets of young children (Dickin, Griffiths, and Piwoz 1997). This technique of developing enriched complementary foods that are based on locally known recipes and local ingredients has been used in a number of countries (Bentley et al. 1991; Kanashiro et al. 1991; Piwoz 1994).

In this study, the recipe trials began with a recipe demonstration conducted by the participants to show the research team how infant foods were usually prepared. A group of mothers used traditional preparation methods to demonstrate current recipes for various foods that had been previously identified as widely fed complementary foods: salt-cracker gruel, bread soup, mashed plantain with fish sauce, and wheat flour gruel. This was followed by the three-step participatory process:

1. A first visit to prepare the trial with the group. Activities included exploring potential improvements of currently fed complementary foods, discussion of an array of suggested ingredients to enrich the complementary foods, creating new recipes, and preparing for the actual recipe trial.
2. The recipe trial. This was followed by a tasting and feedback session on the recipes, techniques, perceived feasibility, and affordability.
3. Follow-up visit. The visit obtained feedback on home-based preparation of the improved recipes and the experience of feeding the improved recipes to children and other family members.

The three-step process was carried out in three zones.² Question guides were developed to facilitate the collection and organization of information at each stage. The ingredients were either purchased by the participants (with cash assistance from the research team) in the quantities they normally used, brought from participants' home gardens, or purchased from local markets by the research team. In addition to bringing ingredients for the recipe trials, other parts of the trial were also supported by the participants. For instance, some trials were hosted in participants' homes. Fuel and cooking utensils were provided jointly by all participants in the group. The arrangements for these logistical issues were worked out by the participants at Step 1 of the recipe trials. The entire process was highly participatory. The research team mainly facilitated the process and ensured that all steps were documented.

At the end of each recipe trial session, participants and their children older than 6 months tasted the recipes. Often, other neighbors and children assisted in the tasting sessions. Issues related to the acceptability, feasibility, and affordability of the recipe were explored through interviews conducted at the end of the tasting session.

The final step of the recipe trials included a set of follow-up interviews with each group of participants, usually two-to-three weeks after the recipe trial session (Step 2). These interviews gathered data on which recipes had been prepared at home between the time of the recipe trial and the follow-up visit. Interviews explored feasibility and affordability as well as any problems that came up during preparation or consumption of the recipes in the home setting. Further, the interviews were used to assess whether participants had adhered to or made further modifications to the recipe.

Finally, data from all the recipe trials were combined for analysis of the feasibility, acceptability, and affordability of the various recipes. The cost and nutrient

² The three-step recipe trial process was conducted in the following zones: (1) Bassin Zim, with a group of two mothers and three grandmothers and their children or grandchildren (1–36 months old); (2) Tierra Muscadi, with a mixed group of five mothers and three fathers and their children (1.5–11 months old); and (3) Marmont (Trois Bois Pin), with a group of five mothers and their children (8–11 months old).

content of each recipe was assessed, and the information was used to identify a list of promising recipes for promotion in the BCC program.

Study Communities

Eleven communities from the Central Plateau were included in the study; six were lowland (administratively belonging to the Hinche Commune), and five were from mountain areas (two belonging to the Thomonde Commune and three to the Lascahobas Commune). Table 3 lists the communities and zones. The regions and communities were selected to represent different areas included in the overall project. The town of Hinche is about 120 kilometers north of the capital, Port-au-Prince.

Table 3—Communities and zones included in this study

Lowland communities (zones)	Highland communities (zones)
Madame Brun (Madame Brun)	
Coloroche (Marmont)	Casse (Casse)
Trois Bois Pin (Marmont)	Fond Pierre (Pareidon I)
Doco (Cherival)	Savane Perdue (Pareidon II)
Pablocal (Pablocal)	Tierra Muscadi (Tierra I)
Bassin Zim (Bassin Zim)	Cachiman (Tierra I)

The lowland communities were generally accessible by road and all were within 6 kilometers of the main road. The main crops cultivated in these areas are staples such as corn, sorghum, beans, cassava, and sweet potatoes. The highland communities, on the other hand, were less accessible by road, more remote, and less densely populated, and their access to water and health services was more limited. Vegetable production was more common in the mountain areas, as was tobacco, which was not cultivated at all in the lowland communities included in the study.

Five communities from La Gonâve Island were included in the study of World Vision’s program implementation. Two communities were located on the coast (Trou Luigène and Anse à Galets), and three in the mountains (Mare Sucrin, Ti Palmiste, and Palma). Lack of rainfall during the last few years has negatively affected crop production

on the island. In addition, the island's flatlands suffer from erosion problems. The main food crops and growing seasons are the same as in Central Plateau but the population of La Gonâve is less self-sufficient in food production. World Vision has been involved in food distribution on La Gonâve Island since 1994. Observations of program activities and interviews with program personnel were also carried out in some communities of Central Plateau where the program had started to distribute food (see Table 1 for a list of communities).

Data Analysis

All interviews were conducted in Creole using semistructured interview guides. Extensive field notes were taken during the interview. Every evening, following data collection, the interview notes were typed up in detail in French, preserving emic terms in Creole where necessary. To facilitate later analysis, the field notes were organized under the main themes of the semistructured interview guides. Topics that emerged during the interview that were not included in the guides were included as separate sections in the interview notes. Verbatim transcripts of the interviews were not prepared because this would have been more complex and time-consuming than analyzing field notes organized by theme or topic. Further, the program planning time line would not permit a detailed textual analysis of verbatim transcripts.

Analysis of the interview notes was facilitated by organizing the data into a matrix. Themes were listed in column headings, and the comments of each interviewee were filled in under the appropriate box. This system facilitated examination of the full range of practices, opinions, and beliefs among the sample, thus providing a picture of practices and beliefs that were common as well as those that were more individualized.

4. Results

This section presents the findings of the first five research topics (see Table 1), which were addressed through individual or group interviews, as well as the results of the

follow-up research (see Table 2) conducted following the debriefing workshops with World Vision staff and Haitian public health professionals. Results of the recipe trials are presented in Section 5. Before describing the results, a short overview of current infant and child feeding recommendations is presented.

Infant and Young Child Feeding Recommendations

Current infant and child feeding recommendations (PAHO/WHO 2003; Dewey and Brown 2003) are that infants should be exclusively breastfed starting from soon after birth and up to 6 months of age. Starting at 6 months, complementary foods should be gradually introduced, while frequent, on demand breastfeeding should be continued until 2 years of age or beyond. The quantity, frequency, and variety of complementary foods should be increased as the child gets older. For the average healthy breastfed infant, complementary foods should be provided 2–3 times per day at 6–8 months of age and 3–4 times per day at 9–23 months of age. If energy density or amount of food per meal is low, more frequent feedings may be required. Dietary diversity is also recommended to ensure that nutrient needs are met, and it is recommended that meat, poultry, fish, or eggs be eaten daily, or as often as possible. The consistency of foods should also be adapted to the infant’s requirements and abilities, and responsive feeding should be practiced, applying the principles of psychosocial care (PAHO/WHO 2003). These recommendations were developed as the Guiding Principles for Complementary Feeding of the Breastfed Child (PAHO/WHO 2003) and are summarized in Appendix 1.

Findings Related to Infant Feeding and Care

To facilitate the description, analysis, and understanding of the many different elements of infant feeding practices, we have utilized the framework proposed by Pelto, Levitt, and Thairu (2003) to organize the biological and social dimensions of infant feeding under the headings of *what*, *who*, *when*, *where*, *how*, and *why*.

The dimension labeled “what” refers to the actual foods that are given to infants (i.e., breast milk, breast-milk substitutes, and foods that complement breast milk) and is primarily concerned with the nutritional features and qualities of foods fed to infants at various stages. “How” is concerned with several aspects of feeding, particularly the way in which caregivers interact with children when they are being fed. This is sometimes referred to as “feeding style.” Other elements included under this include the utensils that are used to offer food, and food preparation and preservation activities. “When” refers primarily to the scheduling of feeding, including frequency and the relationship of frequency to infant appetite. “Where” is concerned with the feeding environment and includes issues of distraction, safety, comfort, and potential for interaction. “Who” directs attention to the relationship of the child to the individual who is feeding him, whether it is the mother or other adult with whom the infant has a primary attachment, another familiar adult, an older child, or a day-care worker or hired caregiver. “Why” is a large dimension that includes cultural beliefs (such as what foods are good or bad for infants or how to feed sick children), economic determinants and constraints, social determinants (particularly maternal time allocation and workload), structural features that affect availability of foods for infants (transportation, markets, etc.), and health issues (such as maternal health and child health status).

Breastfeeding

With breastfeeding, the *what* and *who* dimensions are already well-defined, and the challenges to ensuring successful breastfeeding require an understanding of the other sociobehavioral dimensions. Thus, it is important to understand the following issues for designing an effective BCC intervention in the Central Plateau:

1. *When* is breastfeeding done and what determines patterns of breastfeeding?
2. *Where* is breastfeeding done and where is it culturally unacceptable to do?
3. *How* has the minority of women who do exclusively breastfeed been able to achieve this optimal practice?

4. *Why* do most women fail to exclusively breastfeed their infants?

To answer these questions, our interviews with mothers included several women who were “positive deviant,” i.e., they had managed to exclusively breastfeed in situations where most other women had not. Two of these mothers in Bassin Zim were identified during a group interview with lactating women. Group interviews with mothers of young infants, grandmothers, and fathers also yielded information on perceptions related to practices that sustain and encourage exclusive breastfeeding.

When?

Overall, the breastfeeding women indicated that they usually breastfed on demand when they were at home. The only time breastfeeding was not done on demand was related to the concept of *let cho* (literally, warm or hot milk) or *let si* (sour milk). This was considered to happen when women had returned from a long walk in the heat, and it was believed that children who were fed *let cho* or *let si* could develop an upset stomach. In such situations, women reported that the common practice was to express a small amount of the breast milk, discard it, and then resume normal breastfeeding.

Our interviews investigated this concept, but using the terminology of *let gate* (spoiled milk). This had been revealed as a reason for discontinuing breastfeeding or for feeding other foods in the Grande Anse region of Haiti (Bette Gebrian, personal communication). Our interviews revealed that *let gate* was not as prominent in perceptions about the quality of breast milk among women in our study as in the Grande Anse region. It should be noted that the health communications materials developed by CARE and used by World Vision in this area address this issue and attempt to reassure women that breast milk cannot spoil in the breast.

Where?

One of the questions investigated here was related to the types of places where women felt they could take their breastfeeding infants while they were breastfeeding.

Our interviews with the positive deviants and the groups of women revealed that it was acceptable to take breastfeeding infants to church and to the family farms where women often worked. However, it was not acceptable to take infants to the marketplaces where women went to sell their produce and buy other items. Since market activities appear to take women out of their homes for the longest time and thus pose the greatest deterrent to successful breastfeeding, we investigated to identify reasons for the perception that taking infants to a marketplace was unacceptable. Women reported that in most cases, the markets that they frequented were far from home and entailed walking one to three hours in each direction. They felt that the routes were treacherous and that the sun was too hot for the young infants. Other reasons included poor hygiene at the markets as well as insecurity due to frequent fights in marketplaces. They also reported that they feared the presence of people with malevolent intentions at the markets who could cast a spell on their babies.

How?

Interviews with positive-deviant women yielded useful information on how these women were able to achieve successful exclusive breastfeeding for up to four months. The women interviewed frankly acknowledged the difficulty of trying to breastfeed exclusively, particularly in terms of the toll it took on their freedom to work outside their homes. At the same time, the better health of their children was a tangible benefit and appeared to motivate their perseverance.

The interviews also revealed the presence of supporting factors that allowed these women to breastfeed exclusively for as long as they did. These factors were fairly uniform across the sample, and included the following:

- having adequate resources to pay someone to do their shopping and some housework, usually 15–25 gourdes (\$0.53–0.89);
- physical support from their husbands;

- emotional support from peers and observation of positive role models, i.e., other women with healthy infants who had been breastfeeding exclusively;
- not having to go back to work as early as other women—who usually returned to work around two months after delivery.

Why?

The constraints to exclusive breastfeeding were expressed both by women who did and did not exclusively breastfeed, and included a perception of weakness caused by frequent and exclusive breastfeeding; the need to work and go to the market, and the difficulty of taking the child along; and child-related factors such as gas and colic, which are usually treated with a variety of teas. The positive deviants stressed that exclusive breastfeeding was demanding on their time because they had to be “available to the child” at all times and could not leave their homes for extended periods. Factors that were reported as facilitating the process of exclusively breastfeeding have been addressed in the section on *how*.

The interviews with the positive-deviant mothers who exclusively breastfed their infants for at least four months revealed that all but one had done it for the health of their child. The other woman was mostly motivated to exclusively breastfeed because of its contraceptive benefits. Positive-deviant women had received information on the benefits of exclusive breastfeeding from various sources—health agents, radio programs, and health center staff. In addition, all of the women had been exposed to women who had exclusively breastfed and had observed that their infants were particularly healthy. The women also mentioned that when they first heard about exclusive breastfeeding, they did not believe it was possible to practice. However, their experience (in spite of the logistical constraints) and the benefits they saw with their own infants appeared to have strengthened their resolve to continue. Specifically, three of the four positive-deviant mothers said that they had spent less money on hospital visits with their exclusively breastfed child compared to their other children.

These results imply that to ensure that women can exclusively breastfeed their infant, the program will have to do more than inform women of the benefits of exclusive breastfeeding. It must also address the economic constraints that force women to return to work soon after delivery and recognize the importance of social support to maintain successful exclusive breastfeeding. Additionally, the program should focus on the power of positive role models from the community and highlight the fact that some mothers successfully breastfeed in spite of living in similar conditions with the same daily constraints as other mothers from the same community.

Expression of Breast Milk

In interviews with groups of mothers and grandmothers, as well as in interviews with individual women, we explored perceptions about the practice of expressing breast milk and leaving it behind to be fed to the infant. The rationale for doing this was that all the women reported that they always felt the need to leave some type of prepared food for the child when they left home for their market activities or other work. Usually this was a gruel or a sweetened liquid. Recognizing that expressed breast milk is a much more desirable alternative, we felt it was important to identify how women felt about expressing breast milk and leaving it behind for an alternate caregiver to feed it to the infant later on.

The interviews revealed a range of opinions. At one end was a group of women who reported having practiced this regularly; at the other end were women who could not conceive that this was even possible. It was encouraging to note that most women, however, were positive about it; many had heard about the practice; most had not tried it.

In general, we found that the practice of expressing breast milk and leaving it behind to be fed to the infant was more acceptable in zones where women had heard about expressing breast milk either from the health center, the radio, or from other women (Bassin Zim, Casse, Fond Pierre, etc.), and less acceptable where women had never heard about it or seen anyone doing it (Doco).

Unfortunately, the messages about using expressed breast milk had not gone to the next step of giving women training on how to do it. Some women who had heard about it often were reluctant to try it without getting more training first. They also expressed doubts about how long the expressed milk could safely be stored. Program messages in Haiti have been informing women that it is feasible to store expressed breast milk for up to eight hours, but the women interviewed were not convinced. Previous research has demonstrated that breast milk can indeed be bacteriologically safe when stored in appropriate containers for up to eight hours at moderate temperatures (15 to 27 degrees C) and for four hours at high temperatures (30 to 38 degrees C) (Hamosh et al. 1996; Igumbor et al. 2000). Thus, it appears that programs in Haiti can safely recommend storage in appropriate containers for four–six hours because temperatures are usually 24–38 degrees C but do not exceed 38 degrees C.

Complementary Feeding

To enhance our understanding of complementary feeding patterns, we conducted group and individual interviews with mothers and grandmothers of children ages 0–24 months. We collected information on the timing of introduction and use of different liquids and foods in children’s diets and the rationale for using these products at different ages. We also wanted to improve our understanding of young children’s meal patterns and in identifying potential constraints to increasing meal frequency in infants and young children. The results are presented below.³

What?

The general pattern of introduction of complementary food in the communities studied can be described as follows: long duration of breastfeeding, early

³ Since the choice of foods for young children is highly age-dependent, the dimensions of *when* are addressed in the *what* subsection. The issue of meal patterns within a day (another component of *when*) is presented in a subsection dedicated to *when*.

complementation with the same starchy gruels (salt cracker or wheat flour), and low consumption of animal foods.

Table 4 shows the types of liquids and complementary foods most commonly fed to young infants and the ages at which they are introduced. These are (1) water-based liquids with or without sugar (water, sugar water, sweet teas); (2) cereal gruels with some type of fat (salt-cracker gruel and bread soup); (3) cereal gruels with sugar, but no fat (wheat-flour gruel); and (4) mashed plantain or manioc gruel with a fish sauce.

Table 4—Types of liquids and foods, by age of introduction

<i>What is fed</i>	<i>What it is</i>	<i>When it is fed</i>
1. Water-based liquids		
Boiled water	Water	1–2 weeks after birth
Sugar water	Water with sugar	1–2 weeks after birth
Sweet tea	Water, tea, sugar	1–2 weeks after birth
2. Cereal gruels/soups with source of fat		
Salt-cracker gruel	Water, salt crackers, butter, sugar, salt	1–3 weeks after birth
Bread soup	Water, bread, oil, spices, vegetables, salt	1–2 months after birth
3. Cereal gruels with sugar, no fat		
Wheat-flour gruel	Water, wheat flour, sugar, flavorings (vanilla or cinnamon)	1–2 months after birth (earlier in some cases)
4. Mashed plantain or manioc gruel with fish and fat		
	Mashed plantain or manioc gruel with fish sauce (made with small amount of dried fish cooked in oil and water)	2–3 months after birth
5. Family foods, e.g., bean sauce, cornmeal		
		4 months onward
6. Family foods, e.g., beans, vegetables		
		12 months onward

Note that liquids are generally offered to infants within their first few weeks of life and that even cereal-based gruels are introduced as early as in the first month. The gruels are mostly cereal-based and likely to be very poor in bioavailable micronutrients, although some of them may be of relatively high energy-density (especially those containing oil). The nutrient composition of these gruels is discussed in Section 5.

Findings presented in Table 4 confirm the concerns identified in the previous qualitative study concerning early infant feeding (Menon et al. 2002). Clearly, exclusive

breastfeeding is rarely practiced, and mothers tend to complement (and to some extent substitute) breast milk for nutrient-poor liquids and gruels from a very early age. These practices increase the vulnerability of young infants to infectious diseases, poor growth, and delayed cognitive and motor development. In addition, mothers report introducing family foods to young infants as early as 4 months of age, also a poor practice. Young infants have particularly high energy and nutrient requirements; at the same time, they have limited gastric capacity and motor skills. Thus, they require special foods of adequate nutrient density, consistency, and texture, and they need to be fed more often than adults.

Results of Food-Rating Exercise. A food rating exercise was conducted as part of the group interviews to obtain information on perceptions related to the addition of animal foods and other micronutrient-rich foods to the diets of young children. Groups of women were shown photographs of local foods and asked to choose those they considered especially good (inappropriate) for infants ages 6–12 months. The exercise was conducted with three groups—two groups of mothers of young children and one group of grandmothers—and used pictures of about 20 local foods.

The results presented here focus on micronutrient-rich foods such as eggs, organ meats (e.g., liver), and vegetables (e.g., pumpkin and sweet potatoes).

Animal foods. The food-rating exercises with all three groups revealed that there were no cultural barriers to feeding infants and young children animal foods, including eggs, organ meats, and other meats. The constraints most widely reported were those of resource availability, and in the case of organ meats, market availability. In the case of eggs, the results showed that the yolk was considered most appropriate for infants 6–12 months of age. Almost all mothers identified eggs as good for the health of infants and young children. However, their concern about the expense related to feeding eggs to children suggests that it is not a common practice. Very few participants mentioned the

beliefs articulated by some of the key informants in the previous study that giving eggs to young infants would spoil their teeth, or that eggs would cause convulsions.

The market cost of an egg is 2 gourdes (equivalent to \$0.07 at the time of the study), which is approximately half the cost of a local measure (gode) of millet and one-third the cost of a local measure of maize. Thus, if the cost of one egg was measured in terms of the additional staple food that could be purchased with 2 gourdes, it is substantial. Additionally, many of the women in both group and individual interviews had other young children, often not much older than the youngest child, and it is possible that it would be difficult for them to add an egg only to the portion of the youngest child.

Liver was also identified as a “good” food for infants and young children, but as in the case of eggs, it was perceived to be expensive. In addition to cost, a major constraint to its use is its lack of availability in small portions in markets. It was reported that liver is usually sold whole or in a set with other organ meats and was very expensive (50–60 gourdes—\$1.78–\$2.14 at the time of the study) to buy a whole set. However, some women mentioned that they had been able to buy a piece of cooked liver from *griot* (fried pork) vendors in the market, so this could be an option to suggest to women. However, before this option is suggested, the safety of the prepared meat must be assessed.

Micronutrient-rich vegetables and fruits. Locally-grown, micronutrient-rich vegetables include pumpkin, sweet potato, carrots, and green leafy vegetables such as spinach. Of these vegetables, only spinach and carrots were considered by the women to be good for infants between 6 and 12 months. Carrots are widely given to infants, mostly in the form of carrot juice (which is considered especially beneficial when children have diarrhea). Spinach is used in cooking, but usually in stews and soups, and it is not clear from the interviews whether children are actually fed the vegetable or not.

Pumpkin and sweet potato were both considered inappropriate foods for young children because they were reported to have a laxative effect. Thus, neither of these vegetables were usually fed to infants. However, some women mentioned that it was

possible to give children a small piece of mashed pumpkin from a soup but never a large portion of it. The addition of a small portion of pumpkin to a mashed plantain dish commonly fed to young children was tested during the recipe trials and was found to be well accepted (see Section 5). Thus, it is possible that the perceived inappropriateness of pumpkin for infants relates more to quantity rather than to the food itself.

Mangoes are available from April through July in the study areas and are widely consumed by older children. However, mango was not identified as a food that “helps young children be healthy.” Reasons included that mangoes were sweet, and if children ate these, then they would not eat any salty food. Contrary to many other developing countries where mangoes are widely available, women in our sample did not express the belief that mangoes caused diarrhea in young children. This should facilitate the promotion of mangoes for young children.

In addition to the micronutrient-rich foods mentioned above, a number of staple foods were identified as good for the health of infants and young children. Among these were maize, spaghetti, vermicelli, plantain, and beans. All of these foods are considered to give infants strength and help them grow.

Who?

The section on maternal work patterns and alternate caregivers below presents details of how women organize childcare when they are not at home. Our results related to child feeding indicate that in general, the mother feeds the child when she is at home. However, when she is not at home, the child is fed by an alternate caregiver. In most cases, this seemed to be the child’s father or grandmother, and in some cases, an older sibling. In all cases, the mother reported that she usually left some prepared food behind for the child to be fed in her absence, usually a gruel. In some cases, she also reported that the alternate caregivers would prepare something for the infant.

When?

The question of *when* children are fed relates to meal patterns. The women were asked about the types of foods they fed to children at different times of day. The selected times of day included opportunities for a morning meal, a late morning snack, the afternoon meal, a late afternoon snack, and dinner. Results from individual and group interviews are combined.

The data revealed that infants under age 1 are usually fed a special meal that is prepared earlier in the morning than the family morning meal. This was usually reported to be done when the family morning meal was not ready early enough or when the infant was too young to eat what was prepared at the family morning meal. Thus, foods such as gruels, bread dipped in coffee, and bananas are fed to young infants as a morning meal.

A number of women reported that they did give their 9–24-month-old children late morning snacks, but these were restricted to when the child cried or asked for food before the afternoon meal was ready. Typical snacks included pieces of bread, salt crackers, and mango (which was in season during the study).

The family afternoon meal was usually prepared to be ready any time between noon and 3 p.m., and women reported that they fed older infants (6 months and older) the same foods that were cooked for the family afternoon meal. Very few women mentioned the need to give children a late afternoon snack. This could be because the family afternoon meal was usually prepared late in the afternoon, and the gap between the afternoon meal and supper (or bedtime for infants and young children) was relatively short.

Our findings related to evening meals confirmed that infants are rarely fed any substantial foods in the evenings. Most of the women reported that infants were either breastfed in the evening before going to bed, or they were given light foods such as lemonade and bread or a light gruel. In some cases, the women reported that this was because there was not enough food or money to prepare an evening meal for the family.

However, they also said that an evening meal for the child should be a light gruel or sugar water because a heavier meal would give children indigestion.

The group interviews with older women revealed their prescriptions related to the timing and preparation of special meals for young children. According to them, special foods need to be prepared for children only up to the age 1. The special foods they were referring to were usually the gruels made of salt crackers or white flour.

The interviews related to the influence of stage of development on feeding patterns indicated that the appearance of the teeth was a major stage in terms of its influence on feeding patterns. Essentially, the appearance of the teeth indicated that infants could now be fed other foods. The appearance of the canine teeth (18–24 months for the children of the women interviewed) was seen as the most critical stage and as a sign that breastfeeding could be stopped completely. The period of teething itself was associated with symptoms such as diarrhea. In one group interview, the women indicated that the eruption of the canines was the most problematic stage of teething.

In summary, children are generally fed according to the timing of family meals and are fed special foods only in situations where they cannot (or should not) partake of the foods that are prepared for the family. For example, special gruels are prepared for children who are too young to eat family foods, or in the evenings, when it is believed that children should not be fed heavy foods. Snacks are usually intended to keep the child's hunger satisfied until the next meal is ready and thus, are small portions of crackers, bread, or fruit. The data thus indicate that the feeding of infants and young children is designed to integrate their eating patterns into the family meal patterns as soon as possible. The family eating patterns, in turn, are structured around women's time and household food availability. The notion of special foods and feeding more frequently to provide extra nutrients to infants and children is largely absent and will need to be stressed in the BCC program.

How?

Data on the *how* dimensions of child feeding (mode of feeding, mother-child interaction during feeding, etc.) would ideally have been collected using extensive observations of child-feeding sessions, ensuring that data were gathered for children in each age group (6–8, 9–11, and 12–24). Time and financial constraints, however, did not allow an adequate number of structured observations of feeding sessions. The information reported here is mostly from the interview data.

The interviews revealed that infants and small children are fed from separate bowls and plates than those used by the rest of the family. This is an encouraging practice, as it ensures that caregivers can monitor the amount of food children are served and that they consume. In situations where families eat from a common plate (such as in many African countries), it is difficult to monitor how much young children are consuming.

Information on the mode of feeding of liquids (juices, expressed breast milk) and thin gruels is available from a number of group and individual interviews and indicates that use of baby bottles is widespread. In fact, in two group interviews, one with mothers and another with grandmothers, participants indicated that the use of bottles for storing and feeding expressed breast milk was preferable to use of a cup, as the women felt that a baby bottle would be less likely to get contaminated than a cup. In three individual interviews and one group interview, mothers indicated that they used baby bottles to leave behind juices, expressed breast milk, and other liquids for their infants when they had to go out. It was alarming to note that in one case, the use of the baby bottle to store and feed expressed breast milk was on the advice of the health agent.

The data do not provide an estimate of the extent of use of baby bottles in these communities, and the quantitative baseline survey will provide more information on this aspect of infant feeding. However, data on the use of baby bottles in the Haiti Demographic and Health Survey (2000) showed that 25 percent of infants between 0 and 1 month of age had already been fed using a bottle, and this increased to about 42 percent

by 11 months of age for the entire country. This is clearly an issue of concern: the avoidance of baby bottles and the use of clean cups and spoons as an alternative will have to be promoted through the preventive BCC program.

Why?

The food-rating exercise and other interviews also provided some insights into the reasons for the pattern of introduction of foods reported above. Contrary to the findings from the previous qualitative study (Menon et al. 2002), gas was not identified as a reason for giving foods to very young infants. It was, however, identified as a potential reason for giving the child various *teas* (see Section 4).

A primary factor affecting the introduction of new foods to the child's diet relates to child's age. The gruel made of salt crackers, and liquids such as sugar water, are introduced very early in infancy, in part because there is a perceived need to provide lactating women with some respite from nursing as well as to calm a crying infant. The process of lactation is believed to take a significant toll on a woman's health, and the early introduction of gruels and liquids is meant, at least partially, to reduce this burden.

The introduction of additional foods later on in infancy (3 months and older) was associated with the need to provide foods for the infant when the mother returns to market activities. Buying and selling at local or regional markets necessitate long absences from home, and while women continue to breastfeed when they are at home, a number of preparations are used to feed infants when they are absent. These foods usually include gruels such as the wheat flour gruel, bread soup, and sometimes even mashed rice and beans.

Feeding During Illness

Diarrhea

Ensuring adequate fluid replacement and adequate nutrient intake during and after episodes of diarrhea are critical to prevent dehydration and replace lost nutrients resulting

from diarrhea and increased requirements associated with fever. The group and individual interviews conducted with women who had children age 6–24 months were used to obtain information on feeding practices during episodes of diarrhea.

Three different types of diarrhea were identified: teething diarrhea, diarrhea caused by “microbes” or bacteria, and diarrhea caused by indigestion and flatulence. In one interview, there was no recognition of the diarrhea caused by microbes, but participants indicated that children could also get diarrhea due to “hot milk,” which occurred when a nursing mother spent too much time in the sun and did not drink enough water before breastfeeding her child.

The symptoms of each of these types of diarrhea appeared well defined in terms of the types of stools they were associated with. Treatment for each type of diarrhea was also different and well defined. For example, the “teething diarrhea” was said to be characterized by stools that contained mucus and were watery, while the diarrhea caused by “microbes” was said to be characterized by loose stools, but not as watery as those caused by indigestion. Treatment for all types of diarrhea involved fluid replacement, and usually a reduction in the amount of solid foods, but continued breastfeeding. Other health-seeking behaviors, however, differed between the types of diarrhea. For example, mothers did not feel compelled to seek treatment for teething diarrhea, because they were confident that the symptoms usually went away after the tooth had erupted. For other types of diarrhea, medical care (health agent, health clinic, doctor, etc.) was usually sought after two or three days of fluid replacement and continued breastfeeding if symptoms persisted.

These results were encouraging, showing that the need for fluid replacement was well recognized in this population for all types of diarrhea, regardless of symptoms or perceived cause. However, the preventive program will need to stress that care-seeking patterns should also be the same for all types of diarrhea. It is also important to stress the need for encouraging adequate food intake for children with any type of diarrhea, especially during the convalescence period after an episode of diarrhea or any other illness.

Stomachache

The concept of stomach pain emerged from interviews that were designed to elicit information on the perceptions related to colic and its implications for infant feeding practices. The first phase of qualitative research on patterns of infant feeding had revealed that colic was an important determinant of the early introduction of teas and some gruels to children (Menon et al. 2002).

The findings in this study reinforced that teas are indeed a treatment for colic but that the early introduction of gruels is primarily related to the need for women to go back to their market activities as soon as possible after their child is born. At the same time, the concept of stomachache emerged from these interviews. Stomachache was reported in association with either colic or another ailment, called *fredi*. Symptoms of *fredi* included greenish stools accompanied by stomach pains.⁴

The home treatments for *fredi* and stomachaches were similar in terms of the types of teas and extracts used. These included teas made of cloves, garlic, and herbs. The other form of treatment included wrapping items such as cloves, indigo, or garlic (separately or together) in a thin cloth or a leaf, heating it in coals, squeezing it to obtain an extract, and then mixing the extract with some breast milk.

In the case of *fredi*, it was reported that if it did not get cured in two days with the local treatment, the child would be taken to the dispensary or health center. However, in the interviews where this concept emerged, women indicated that it was usually cured by the home treatments and that after two days of treatment, the stools returned to their normal color, a sign that the *fredi* was cured.

The concern about the use of teas to treat stomachaches associated either with colic or *fredi* is the risk of contamination of the water or of the container used to serve the tea, as well as the disruption of exclusive breastfeeding. As far as *fredi* is concerned, it

⁴ *Fredi* was reported to be caused by leaving the child's clothes wet without washing and drying them well, or by letting the infant sit naked on soil that was cool and humid.

does not seem to be associated with watery stools; therefore, it probably does not require active fluid replacement.

The design of the BCC program should take into account the role of teas and other liquids for treatment of various ailments as well as for fluid replacement during diarrhea. These practices appear to be strongly entrenched and may be a major constraint in efforts to promote exclusive breastfeeding.

Maternal Diet During Lactation

Two group interviews, each with five lactating mothers of infants 0–6 months of age in Bassin Zim and Savane Perdue, as well as one interview with a group of eight grandmothers in Bassin Zim, assess food beliefs and proscriptions during lactation. The interviews revealed that the food beliefs around the time of lactation identified in the first study appeared to be normative and well adhered to, possibly because of the perceived vulnerability of the state of the mother at this time. The food restrictions are prescribed primarily during the first three months of lactation.

Some of the food proscriptions are related to the potential detrimental effects of particular foods on the infant, but most are related to their perceived effects on the lactating mother. The restrictions include starchy roots (yams, sweet potatoes), pulses (white beans), vegetables (tomatoes, onions, okra, carrots, pumpkin, eggplant, cabbage, white chayote, fruits [melon, citrus fruits, avocado]), fish (except one type named *paroket*), and cow's milk. Women often associate the white color of the food with the restriction.

Some groups also discussed foods that lactating mothers should eat. These include papaya to increase the production of breast milk; leafy vegetables, in general, to increase the blood production and protect the body; beans (black or congo) and liver, because of their high content of vitamins and especially iron; cereals (corn, millet, rice), starchy roots (manioc), and plantain, because they give strength; meat, cow's milk, and eggs, which are good for the development of the child. Recommended dishes are cooked

plantain with meat, vegetable soup with meat and staples, and rice or corn with a bean sauce.

The interviews confirmed the existence of a large number of cultural beliefs about dietary restrictions during lactation in this population and that many mothers adhere at least to some of the dietary restrictions. It is impossible, however, to determine from the qualitative work whether these restrictions result in poorer dietary quality during lactation or whether mothers still manage to maintain adequate energy and nutrient intakes by consuming foods that are not subject to these restrictions. It is important to remember that these restrictions are mainly for the first three months of lactation. Although this is a relatively short period, this is a period of great demand on the mothers' nutrient reserves, because they are recovering from the demands of pregnancy and labor, and at the same time, they are lactating. Additional research, possibly quantitative, will be needed to explore the implications of dietary restrictions during lactation on maternal diets, nutritional status, health, and energy levels. It is important for the successful promotion of exclusive breastfeeding to ensure that mothers meet their daily energy and nutrient requirements and that they have the physical capacity to practice exclusive breastfeeding without depleting their nutrient reserves. These aspects need more investigation and will be addressed in operations research studies to be conducted in 2004.

Maternal Work and Alternate Childcare Use

This section presents findings related to patterns of women's work in the communities studied and the implications of these patterns for child feeding.

Maternal Work Patterns

We used group and individual interviews to explore the patterns of women's work and to assess how women organized their childcare responsibilities. Overall, we found that the two main occupations for women in this region of Haiti were agriculture and market activities. The agricultural activities are primarily related to tending the family farms or home gardens, and in many cases, this involves working alongside husbands.

Market activities are referred to as *petit commerce* in Haiti, which implies the buying of products in one market and selling them in another. In some cases, women also sell their own produce.

The market system in this area of Haiti is organized in weekly or biweekly markets held in different towns in the region. The buying and selling at the weekly markets are done mainly by women, who often travel long distances on foot or horseback to get from one market to another, or from home to the markets and back.

The poor accessibility of the markets implies that women have to stay away from home for long periods of time to carry out their market activities. In our interviews, this ranged from a minimum of 5 hours up to 24 hours in rare cases. Women reported being away from home anywhere from two to seven days a week, depending on which markets they frequented.

Organizing Childcare

Most women in the sample were involved in market activities. For these women, childcare was a key constraint, because they did not feel comfortable taking their child along when they went to work in the markets. The small number of women who worked on their family land, however, indicated that they usually took their children with them when they went to work in the fields, and that they usually left them in a shady spot while they worked.

The interviews suggested that market women delayed their return to work until their child was 2–3 months of age, unless economical constraints forced them to return to earn money to purchase food for their family. Infants were usually left in the care of their fathers or grandmothers. In some cases, women reported leaving their infant with an older sibling who could feed and care for the infant. In most cases, women reported that they left some prepared food for the infant to be fed by the alternate caregiver. In a majority of cases, this was a gruel, lemonade, or sugar water. Only one woman reported that she had expressed breast milk and left it behind for the child, and she had done so only until the child was 3 months old, after which she switched to gruels.

One of the aspects that was not investigated in our research is whether the fathers, in turn, left the infants with someone else when they had to leave for work or attend to other household responsibilities. Our interviews with mothers on their work patterns did not yield information on this issue.

One disturbing finding related to the use of childcare alternatives was that in one group interview, women felt that a very young infant (2–3 months old) could easily be left with an alternate caregiver since, according to them, children at that age “cry for the breast and not for the mother.” Between 5 and 6 months, they said it was more difficult to leave a child with someone else, even though they often did so, because, by that age, the child was “crying for the mother.” However, from when the child was about 10 months old, women indicated that it was again easy to leave the child with someone else because, by then, the child could eat everything. These findings, taken with other information on feeding children, suggest that the pattern of early introduction of gruels and liquids is, in fact, designed to ensure that infants get used to consuming foods other than breast milk, which, in turn, makes it easier for women to return to work as early as when the infant is 2 months old.

The information related to the stages of child development revealed that the stage when children began to sit up on their own was perceived by mothers as an indication that the child could now be left with someone else. Also, group interviews with mothers revealed that this was perceived as a stage when the child did not have to be watched as much as before, which allowed mothers to do their work around the house. Women indicated that this happened when girls were 2.5 months old and boys were 3.5 months old.

Our findings highlight that mothers face trade-offs in their dual roles as caregivers and breadwinners. In this population, maternal employment may truly be a key constraint for exclusive breastfeeding, and to a lesser extent for adopting optimal complementary feeding practices from the time the infant is 6 months of age. As seen in many other cultures, mothers do attempt to protect their infants by staying at home for as long as they can afford to, but among resource-constrained populations, this period is

rarely longer than two or three months after birth. Thus, unless mothers extract and appropriately store breast milk for feeding the infant in their absence, exclusive feeding of breast milk to infants less than 6 months is almost impossible. Finding appropriate ways of storing breast milk, given the high ambient temperatures in Haiti, is also critical, since expressed breast milk can be stored for a maximum 4–6 hours in temperatures between 25 and 38 degrees Centigrade. Although the situation may be less complex when the infant reaches 6 months of age and starts consuming complementary foods, absence of the mother for extended periods is still likely to interfere with the recommendation to continue on-demand breastfeeding at least until the child reaches 24 months of age. Information from our quantitative baseline survey should shed light on the importance of market work among women in this population, and on how frequently and for how long mothers have to be separated from their young infants. Although the qualitative study indicated that most working mothers could rely on adult relatives to assist them with childcare, it is not clear what happens when the substitute child caregivers themselves (such as the fathers, for example) have to work and leave the home. The quantitative baseline survey will also provide more information on these aspects.

The Role of Fathers as Caregivers

To understand the caregiving roles played by fathers, we conducted interviews with groups of fathers to see how they viewed their responsibilities to their children. Two group interviews (Marmont and Casse) and one interview with a couple (Doco) provided the data for this topic.

The interviews revealed that fathers had a very broad view of their caregiving roles and did not think of themselves solely as providers of income and food. The provision of food and money, imparting moral and spiritual guidance to their children, taking their children to the health center when they were ill, and ensuring that their children were well-educated were among the responsibilities they defined for themselves. They were also actively involved in the care and feeding of younger children, including bathing, cleaning, feeding, preparing food, and performing a number of other activities.

However, this occurred mainly when mothers were away from home, and mothers were, as in many other cultures, perceived as the primary caregivers.

The groups of fathers interviewed all expressed a deep interest in learning more about caring for their children, and even suggested that they felt neglected by program activities that were typically targeted only to women. They suggested that a weekly meeting forum for men would be an acceptable and feasible venue for them to attend to obtain information about how to improve their caregiving skills. One practical suggestion was to have separate mothers and fathers clubs held at different times of the day so that at least one parent could attend the club if the other was working or away at the time of the club meeting.

The fathers who were interviewed for this study were mostly involved in agricultural activities and tended their farms in the morning, usually returning home at noon for a break, and again later in the afternoon for their meal. Unfortunately, the interviews did not provide further information on the detailed schedules of the fathers and whom they left the child with when they had to be at work. At the same time, agricultural work is more flexible in terms of timing than market activities, and it is possible that parents adjust their working patterns to accommodate childcare responsibilities.

Overall, the results on the roles of fathers suggest that they play a greater role in childcare than has been acknowledged in the planning of program activities. Given the extent to which they participate in daily care activities for their children, it is imperative to include fathers in the BCC program.

Follow-Up Research Results

The results described above were presented to an audience of program personnel in Haiti at a workshop in October 2002. Discussions related to the results generated a set of questions that warranted further research by the IFPRI-Cornell team. Some of the issues raised by workshop participants are described below.

1. *Availability of iodized salt.* Concerns related to the highly prevalent problem of iodine deficiency in the country, and of the very low coverage of iodized salt in the country were raised. We investigated the situation related to the availability of iodized salt in the study communities of the Central Plateau.
2. *Availability and use of animal-source foods (ASF).* The recipe trials (see Section 5) and the other findings related to child diet had clearly identified a problem with low intake of micronutrient-rich foods among infants and young children, particularly iron and zinc. To identify affordable sources of micronutrient-rich foods, we conducted interviews to explore the feasibility of promoting specific types of ASF that may be available in the area, and verified their availability in local markets. We also explored the possibility of desalinating salted fish prior to its use to facilitate incorporating larger amounts of fish in complementary food preparations. Finally, since World Vision has a goat distribution project in some of their program areas, we investigated local perceptions related to the use of goats' milk in gruels in those areas.
3. *Local methods of keeping liquids cool in the absence of refrigeration.* One of the concerns raised at the workshop related to the possibility of keeping breast milk cool enough under the environmental conditions in rural Haiti, particularly when mothers were likely to be away from home for long periods. Our review of the literature related to this had suggested that breast milk could be stored for 4–6 hours, depending on the ambient temperature. However, we also investigated local methods of keeping liquids cool without refrigeration facilities to assess the feasibility of promoting these methods for preserving expressed breast milk.
4. *Special needs of children 12–24 months of age.* The discussions also raised the concern that children ages 12–24 months did not seem to receive adequate care for their age. We conducted interviews in the program areas to explore this issue and identify ways of motivating parents to ensure that they were aware of the special needs of young children beyond age 1.

Availability of Iodized Salt in the Markets

Iodized salt was not available in any of the local markets. The local salt available came from Port au Prince and from Cap Haitien. Iodized salt was found only at the local supermarket in Hinche, which is used primarily by wealthier families in the town of Hinche. The iodized salt available there was imported from the United States and was sold at a price about 20 times higher than that of the noniodized salt available in the local market. Thus, iodized salt was largely unavailable, and when available, it was unaffordable for a large segment of the population.

Availability and Use of Animal Source Foods

Perceptions and Use of Meat and Liver for Young Children. Following previous findings that there were no cultural barriers to feeding young children red meat or organ meats, we further investigated the different ways in which meat and liver were fed to infants and young children. The main formative research study had investigated perceptions related to feeding organ meats, under the presumption that organ meats are usually cheaper and more accessible for poor families. However, the interviews revealed that in fact, the use of organ meats was limited by low availability and poor access. Thus, we decided to explore in this follow-up research other types of meats as well. The aim was to investigate the availability in local markets of meat and organ meats sold in small amounts at more affordable prices than entire animals or organs.

Interviews on the types of meat fed to young children were conducted in Moruque and Tierra Muscadi. The data from both sites show that chicken and goat were considered most appropriate for young children. In one place (Moruque), beef was considered too expensive and it was also reported that it could cause illnesses, and therefore was not consumed much. Pork was not considered appropriate for children because the participants felt that it did not contain any vitamins.

The types of preparations that contained meat and were felt appropriate for young children included soup, meat sauce, and mixed vegetables cooked with meat. The soups

included vegetables and starches, which were often mashed and passed through a strainer, and the strained portion fed to infants from 7–8 months onward, using a baby bottle. We investigated whether what remained in the strainer could also be offered to the infant and did not encounter any strong resistance to this, although some participants felt that all that was “good” had passed through the strainer into the soup liquid. They felt that it would be good to mix in some of the strained broth with what was left in the strainer to feed to the child.

Meat sauce was prepared using spices and tomato paste, and sometimes potatoes or other starchy vegetables. The meat itself is well cooked and mashed into the sauce, which is then served with mashed plantains or cooked cornmeal. Another preparation using meat included mashed vegetables cooked with meat. With this recipe as well, the meat is well cooked and mashed into the preparation.

With all the meat preparations, it appeared that these could be fed to children beginning at 7 or 8 months of age. The preparations where meat was mashed well were sometimes made especially for the child, but these could also be consumed by the entire family. Once the infant reached the age of 12 months or had teeth, participants reported that they could sometimes give the child a small piece of meat from the family meal. For those recipes where the meat was prepared especially for the infant, it was reported that the quantity used increased with child age—from a piece that cost 5–10 gourdes (\$0.20–\$0.40 at the time of the study) for a 7–8 month-old child to a piece costing 15–20 gourdes (\$ 0.60–\$0.80) for a 12-month-old child. The quantities available for this amount of money were investigated in different local markets (reported below).

Overall, it appears that there is a variety of meat-containing preparations that can be prepared especially for the young child, even though all may also be prepared and consumed by other family members. A challenge for the BCC program will be to encourage both the preparation of these foods and the consumption of the meat in the preparations by the child, rather than only the broth from the soup or the sauce/mashed vegetables without the meat.

Availability and Use of Liver. Information on the use of liver was also obtained from interviews in Moruque and Tierra Muscadi. The findings from Moruque showed that children could be fed either chicken or goat liver. In Tierra, goat, beef, or chicken liver was fed to children. Chicken liver was not sold in the markets in either site and was only fed when an entire chicken was used in the home. The participants also reported that a number of organ meats were called “liver,” and organs such as the lungs and heart were often sold using the term *foie*, meaning liver. Liver itself was called *foie dur*.

The preparations using liver included a sauce made of mashed liver or a soup. The sauce was fed along with mashed plantains and was made especially for the child as it was too expensive to buy liver for the whole family. However, the adults and other members often taste the liver preparation made for the child. Also, in both places, this was prepared very infrequently, even though women reported that they could possibly prepare a piece of beef liver that costs 5 gourdes (\$0.20) two-to-three times a month. In Tierra Muscadi, goat liver was not available for purchase by the piece, and the whole liver was expensive (75 gourdes, or about \$2.70). In Moruque, pieces of goat liver costing 5 gourdes (\$ 0.20) were available.

In summary, this set of interviews about the affordability and use of liver for children revealed very similar findings as previously reported. Although liver is acceptable and considered good for infants and young children, its use is severely limited by its high cost and lack of availability in small, affordable amounts.

Availability of Meat and Liver in Local Markets. Visits to local markets in Hinche, Thomonde, Merehil, and Ti-Casse were conducted to evaluate how much meat and liver could be purchased for the amounts of money that women had indicated they would be willing to spend. Table 5 shows the results of the market studies and indicates that there was a large variability in the amounts that could be bought for 5–10 gourdes (\$0.20-\$0.40). For beef, the quantities available for 5 gourdes (\$0.20) varied from 50 grams in Hinche to 190 grams in Merehil. Similar variability was seen in the prices of goat meat and beef liver between Merehil and Hinche. The market studies also showed

that pieces of chicken were not available, and liver was unavailable in one of the local markets. One of the reasons for the large discrepancy in amounts could be the location of the markets. For example, Hinche and Thomonde are large markets with easier access from the main road and cover a larger population pool. Therefore vendors can sell less meat for the same amount of money. Merehil, on the other hand, is a large market but is not easily accessible due to poor roads. Ti-Casse is a smaller local market where meat and liver are not sold at all.

Table 5—Amounts of meat and liver available for a set price in local markets in Central Plateau^a

Market	Smallest piece of beef sold		Smallest piece of goat meat sold		Smallest piece of beef liver sold		Smallest piece of goat liver sold	
	Price (gourdes)	Quantity (g)	Price (gourdes)	Quantity (g)	Price (gourdes)	Quantity (g)	Price (gourdes)	Quantity (g)
Hinche	5	50	5	40	10	70	5	
Thomonde	Not sold	Not sold	5	57	Beef and goat liver are not sold in pieces; whole beef liver costs about 150 gourdes and goat liver, about 50–60 gourdes			
Merehil	5	190 g	10	195	5	240	Not sold on day of visit	
Ti-Casse	Not sold		Not sold		Not sold		Not sold	

^a Exchange rate at the time of the study was US\$1 = 28 gourdes.

Desalinating Dried Salted Fish Prior to Use. Our analysis of the recipes prepared during the recipe trials revealed that many of the recipes contained excessively high amounts of sodium per serving. In addition to the salt added during the cooking, dried fish, which is salted heavily, is also likely to contribute to the sodium content of the food. Furthermore, since it is desirable to promote the use of a larger quantity of dried fish in the gruel recipes, it was considered important to evaluate whether it would be feasible to promote the practice of soaking the fish in water to desalinate it before use. This was explored through the group interviews in all four sites.

The results show that in three of the four sites, the participants already desalinated the fish by soaking it in water before using it. In the fourth site, the participants indicated that it would not be a problem to desalinate the fish before use, and that this was a good thing to promote through the program. Thus, it appears that the practice of soaking dried

fish in water to desalinate is feasible and acceptable to promote through the BCC program.

Feasibility of Using Goat's Milk. World Vision has been distributing goats in some parts of the Central Plateau over the last few years. Based on this, we explored perceptions about the use of goat's milk for infants. In all sites, goat milk was perceived as being a "rich" food and good for infants. In fact, in Bassin Zim, interviewees reported that they would dilute a cup of goat's milk with half a cup of water since it was so much thicker than cow's milk. All of the interviewees thought it would be appropriate to add goat's milk to gruels and other preparations for young infants and also to feed infants goat's milk itself. In fact, some were already doing so.

The problems related to use of goat's milk were that it was not available in the markets and that it was not used when there were problems with the goats themselves (for instance, if the goats were sick or not producing enough milk). In two interview sites, participants reported that the goats themselves were not getting enough to eat because of the lack of greenery.

The results indicate that, contrary to our expectations, goat's milk was, in fact, perceived as a rich food that was good for infants and children. The restrictions to its use were related more to the availability of goats and their health rather than to cultural barriers. The BCC program can thus safely promote the use of goat's milk for children in both the preventive and recuperative program.

Methods of Keeping Liquids Cool in the Absence of Refrigeration Facilities

The literature on the optimal duration of storage of expressed breast milk (Hamosh et al. 1996; Igumbor et al. 2000) suggests that in the tropical temperatures commonly seen in rural Haiti, breast milk should be stored at room temperatures for a maximum of 4–6 hours. These results were met with apprehension by the program stakeholders in Haiti, as current programs promote the storage of expressed breast milk for up to 8 hours and use this as an incentive to promote the practice of using expressed

breast milk. It was felt that dropping the ideal storage time to 4–6 hours would create confusion, since Haitian women are often away from the home for more than 4 hours. An alternative was to investigate local methods of keeping things cool where no refrigeration is available. This would allow programs to continue to promote the storage of expressed breast milk for up to 8 hours, with a conditional statement about the ambient temperature and ensuring that the breast milk was kept as cool as possible.

We conducted interviews in all four sites. The results showed that the communities had devised innovative methods of keeping liquids cool. In homes where the floor was made of earth, a small trough was dug that was then dampened with water. The liquid to be kept cool was then put into a earthenware container called a *canari* and this was then placed in the cool, damp trough. In homes with a cement floor, it was reported that a small trough was made in the kitchen at the time of construction and that this was dampened as needed to keep the *canari* cool.

Other alternatives reported were to put the container with the liquid into another one filled with water, or to put it into a thermos flask that contained cool water. However, it appeared that the *canari* was the preferred option. Participants in one site, however, reported that it was increasingly difficult to find good earthenware *canaris* in the market, as most people used plastic containers. Those that were available were too expensive (about 100 gourdes or \$3.60) and of poor quality, according to the interviewees.

Perceptions of the Special Needs of Infants Ages 12–23 Months

We conducted interviews to identify factors that could be used to motivate parents to pay special attention to the needs of children in this age group. Interviews done in Bassin Zim indicate that the real problem, as perceived by the participants, to giving more care and attention to a child between 12 and 23 months is a lack of resources rather than lack of knowledge. The same group also offered some suggestions as to how mothers might be motivated to pay more attention to children 12–24 months old. These included cooking together in groups (where each woman would bring one ingredient) or

promoting the need for more attention to children 12–24 months by focusing on the development of the brain at this age.

Data from interviews in other areas showed that the mothers thought that children *should* get more attention and special meals until they reach 2 or even 3 years of age. However, they indicated that this was not easily achievable, mainly due to financial constraints. Thus, between 12 and 15 months, the child is likely to be fed the same food as the family and with the same frequency, with extra meals or snacks being provided only if it is felt that there are enough resources to do so.

Overall, it appears that the BCC program will have to focus energy on ensuring that children aged 12–23 months receive enough care and attention. The notion that children do not receive special attention unless there are adequate household resources indicates that families in this area face severe resource constraints and that there is possibly a lack of understanding that the resources needed to prepare special foods more frequently for young children may not be as great as thought.

Previous research in Bangladesh—which is also extremely impoverished—has indicated that increasing the dietary intake of infants ages 6–24 months to the required level requires an additional expense of 8 percent of the household budget, compared to 21 percent to increase the dietary intake of a lactating woman to desirable levels (Brown et al. 1993). It is possible that the promotion of simple, inexpensive, enriched recipes for complementary foods and snacks for infants and young children can convince parents of the feasibility of preparing special foods for infants. However, in addition, the BCC program will have to focus attention on addressing resource allocation issues in terms that are well understood by participants.

5. Results of Recipe Trials

The methodology of using recipe trials to develop enriched complementary foods using local ingredients is well developed and has been used successfully in a number of countries. Recipe trials usually start with the identification of the commonly fed local

complementary foods. This is followed by group discussions of the local recipes, feasible options to enrich them, and trials to test the acceptability of modified recipes (Dickin, Griffiths, and Piwoz 1997). In some countries (e.g., Nigeria), the recipe trials have been combined with an approach called trials of improved practices (TIPS) (Dickin, Griffiths, and Piwoz 1997), where follow-up interviews investigate the feasibility of preparing the enriched recipes in home settings as well as other behavioral modifications to usual patterns of complementary feeding.

In Haiti, we conducted the recipe trials in three phases (see Section 3), which included discussion of enrichment options, testing of recipes, and follow-up feasibility interviews. The results are summarized following a preliminary description of currently fed complementary foods. For each modified complementary food, issues related to its acceptability, feasibility, and affordability are also summarized. The section concludes with a discussion of the nutritional qualities of the complementary foods.

Complementary Foods Currently Fed to Infants and Young Children

As reported in Section 4, mothers in this study traditionally prepare three types of complementary foods: (1) cereal gruels with some type of fat (salt cracker gruel and bread soup); (2) cereal gruels with sugar but no fat (wheat flour gruel); and (3) mashed plantains with a fish sauce. The main ingredients included in these gruels were presented in Table 4. The wheat flour gruel and the mashed plantain with fish sauce were selected for modification through recipe trials. The reasons for choosing these two recipes are as follows:

- The salt cracker gruel is usually fed to very young infants and is used as a breast-milk replacement and to give some relief to breastfeeding mothers. This is made especially for the young infant, and mothers stop using it after the infant is about 4 months old and starts receiving other gruels or bread soup. It was decided that rather than attempting to enrich the salt cracker gruel, the education and behavior change program should rather discourage use of this product for young infants as

part of its promotion of exclusive breastfeeding in the first half of infancy. In particular, we felt that modifying this recipe could run the risk of providing justification for mothers to continue the practice of early complementation. To avoid this, the salt cracker gruel was not considered as a potential vehicle for improving complementary foods.

- The bread soup was not considered for modification because it appeared to be of low nutrient density to start with and offered little potential for enrichment.
- The white flour gruel and the mashed plantain with fish sauce appeared to be better candidates: they are given to infants from age 3–6 months until the child consumes family foods. These dishes are also widely used by all household members and are considered family foods. In addition, the wheat-soy-blend (WSB) food commodity distributed by World Vision is a flour mix similar to the flour currently used to prepare the white flour gruel. Thus, new and enriched gruels could be prepared using donated foods targeted to the child.

Note that no recipe was identified that was prepared *only* for the young infant as a special complementary food, with the exception of the salt cracker gruel. Ideally, we would have identified a special food to enrich that was consumed only by the infant, because it is much less costly to enrich a small amount of food to be fed to a young infant than to enrich a food consumed by an entire household. However, having identified only salt cracker gruel as the “special infant food,” we decided to work with more promising recipes.

The recipe trials did not evaluate the development of special recipes using meat or organ meats for young children. Since the focus was on gruel-type recipes, which do not traditionally contain meat or organ meat, these foods did not emerge as candidate ingredients for recipe enrichment. The follow-up research on types of meat recipes fed to infants was conducted only after the recipe trials were completed. Thus, there was no opportunity to test the feasibility and affordability of using meat sauces and small pieces of meat for infants and young children. The recipe trials did, however, explore the

options of adding special ingredients, such as a beaten egg or extracted breast milk, to a portion of the gruel served to the under-2 child (see findings below).

Modified Recipes Developed During the Recipe Trials

The list of modified recipes developed during the recipe trials is presented in Table 6. Information on the acceptability, perceived feasibility of preparation, cost of the recipe, and the results of the follow-up interviews conducted to assess whether mothers had prepared the recipe at home is also summarized.

The most promising recipes from the point of view of cost, acceptability and feasibility were

- gruels made of the fortified food aid commodities with added fish or dry milk, and
- gruels made of wheat flour and enriched with the addition of
 - beans and sugar,
 - beans and dried fish,
 - a beaten egg added to the child's portion, and
 - expressed breast milk added to the child's portion.

Mashed plantain preparations with pumpkin and fish sauce were also well accepted, but were among the most expensive recipes. The snacks using food aid commodities were also much appreciated, but mothers may not have the time to prepare snacks in addition to regular meals.

The use of beans in the recipes, although culturally and nutritionally desirable, adds considerably to the number of preparation steps and time involved because beans must be processed by roasting, removing the skin, and powdering. This may considerably reduce the likelihood that mothers make these preparations on a daily basis. However, because they were very popular in terms of taste and child acceptance, they can still be promoted for preparation, albeit on a less frequent basis.

Table 6—Summary of recipes tested through recipe trials

Name of recipe/behavior change	Place where developed/tried	COMMENTS ON RECIPE			
		From discussion after recipe trial		From follow-up interviews	
		Acceptability	Feasibility (number of preparation steps + cooking time)	Cost ^a (gourdes)	Whether actually tried, at home + feasibility of sustained preparation
Milliet gruel with black beans and groundnuts	Bassin Zim	Very good	10 + 45	11.5	Yes. However, cost of beans and time-consuming recipe were constraints.
Wheat flour gruel with black beans and groundnuts		Very good	7 + 25	11	No. Cost of beans and time-consuming recipe were constraints.
Milliet snack (Cham-cham)		Excellent	9 + 15	> 20	Yes, but made without groundnuts due to cost.
Wheat flour gruel with black beans and dried fish	Marmont	Less liked than sweet version; considered too thick for a 6-month-old	4 + 35	9.25	Yes, all women tried it. Felt sweet version was more liked by children, however.
Wheat flour gruel with black beans and sugar		Good; considered too thick for a 6-month-old	4 + 35	8.25	Yes, all women tried it. Well accepted by children.
Mashed plantain with pumpkin and fish sauce		Good	2 + 35	13	Yes, all women tried it. Well accepted by children.
Wheat flour gruel with black beans, sugar, and oil	Tierra Muscadi	Good, consistency too fine	4 + 35	11.25	Only 2 of 5 women tried it. Lack of money to buy beans and lack of time were constraints.
Mashed plantain with pumpkin and fish sauce		Excellent	2 + 35	17.5	Three of 5 women tried it. Well liked. Lack of availability of pumpkin pieces in market was a constraint, but can be prepared when pumpkin is available in gardens.
Addition of egg to wheat flour gruel		Good	1 + 35	6.25	Two of 5 women tried it. Well liked by children.
Addition of expressed breast milk to gruel		No information	Depends on gruel made	Cost of the gruel made	All lactating women in the group tried it. Well liked by children.
CSB gruel with dried fish	Marmont	Good	2 + 20	6	Follow-up interviews not done, but can be considered feasible because major ingredients (CSB/WSB and oil) are donated by the program.
CSB gruel with dried milk and sugar		Very good	1 + 15	6	
CSB fried snack (acra)		Very good	2 + 15	4	

^a Exchange rate: 28 gourdes = \$1 at the time of data collection.

One constraint to the sustained use of most enriched recipes is that these gruels are generally prepared for the entire family, and therefore, preparing an enriched product entails a much higher cost than simply adding small amounts of high-quality foods to the child's portion. The option of adding an egg or expressed breast milk to the child's gruel seems a good alternative, and women were positive about the suggestion to prepare these enriched porridges only for the youngest members of the family.

Relative to cost, the cheapest improved preparations are, as expected, those based on use of donated flours and oil. The next cheapest preparation is the wheat flour gruel with an added egg. This recipe is cheaper than adding black beans and dried fish, or black beans and sugar, to the wheat flour gruel, and is clearly cheaper than all preparations that include a source of fish. In terms of acceptance and energy density, this preparation is also a good choice. Even if the fish preparations are more expensive, the unique nutrient composition of fish is worth the effort of promoting its use, at least once or twice a week, if families can afford it. Further exploration of the availability of chicken or other small livers, which would be cheaper than the large livers currently available in markets, will also be pursued.

Observations about Recipe Trial Participants

A methodological aspect of the recipe trial process to be noted is that there was a differential trial and adoption of practices, depending on the characteristics of the women in the recipe trial group. Table 6 also shows that the women of the Marmont group tried the modified recipes at home more often than the mothers of the two other groups in Bassin Zim and Tierra Muscadi. Some of the reasons for this could be a higher level of training and knowledge among the women in Marmont (two were daughters of a *colvol*, one had attended a cooking course, and another one a sewing course); and fewer children (three had only one child each). Additionally, they appeared to have a better understanding of the importance of cooking special recipes for young children only, were relatively young mothers, lived close to the marketplaces, and had children who were in

the 8–12-month age group (when gruels are most likely to be consumed). The two other groups (Bassin Zim and Tierra Muscadi) we worked with were heterogeneous with respect to the age of the youngest child, the age of the women themselves, and the number of children they had. We recommend that future recipe trials be conducted with as homogenous groups of women as possible, with attempts to ensure that women with children in an age range most likely to consume enriched gruels are reached at the same time.

Nutritional Quality of the Complementary Foods

Our analysis of the nutrient content of the currently fed complementary foods and the modified recipes is based on current WHO recommendations for complementary feeding (Dewey and Brown 2003). The ability of the complementary foods to meet the requirements for infants at different ages is assessed in terms of energy and micronutrient density (particularly iron, zinc, and vitamin A). The analysis was done using a software program called Food Processor 7.1 (ESHA) and utilized U.S. Department of Agriculture (USDA) food composition values.⁵

Energy Density

Current WHO recommendations suggest that infants age 6–8 months should receive at least 200 kcal/day from complementary foods (PAHO/WHO 2003). For 9–11-month-olds, energy from complementary foods should be 300 kcal/day, and for 12–23-month-olds, 550 kcal/day. These guidelines are based on children receiving average amounts of breast milk. If infants and young children consume more or less breast milk than average, their energy requirements from complementary foods will differ accordingly. These recommendations also assume good maternal nutritional status and adequate breast milk intake and composition of breast milk.

⁵ Calculations for the wheat flour gruels used nutrient composition values for nonfortified wheat flour, since the levels of enrichment of wheat flour in Haiti are unknown.

The number of times infants and young children should be fed complementary foods depends on the average energy density of their diet (kcal/g of main complementary food) and the amount they consume at each feeding. The recently developed *Guiding Principles for Complementary Feeding of the Breastfed Child* (PAHO/WHO 2003) recommends that complementary foods have a minimum energy density of 0.8 kcal/g. Children fed diets of lower energy density have to be fed more often than those who are fed diets of at least the minimum recommended energy density, or they have to be fed larger amounts at each feeding. Given their limited gastric capacity, infants and young children may be unable to consume sufficiently large amounts of complementary foods at each feeding to fulfill their energy requirements if the energy density of their diet is lower than 0.8 kcal/g. Similarly, given the time constraints of caregivers in developing countries, it is unrealistic to think that infants and young children can be fed more than 4-to-5 times per day. Thus, low-energy diets are considered inappropriate for infants and young children in developing countries, because they drastically increase the risk if not meeting daily energy requirements. Increasing the number of meals per day is not only impractical, but it may also displace breast milk intake, and therefore is not recommended.

Taking these factors into consideration, current recommendations are that infants 6–8 months of age should be fed complementary foods 2-to-3 times/day, and 9–1 and 12–24-month-old children 3-to-4 times/day. These recommendations, however, only apply to children whose diets provide at least 0.8 kcal/g (PAHO/WHO 2003).

Table 7 presents the energy density (kcal/g) of the currently fed complementary foods as well as the modified recipes developed during the recipe trials. Also, using information on average serving sizes used at different ages (assessed during the discussions that followed each recipe trial), the table presents the number of servings of

each of the gruels that would be needed to meet the energy needs of children in different age groups.⁶

Table 7—Summary of energy densities of currently fed complementary foods and of modified recipes

Name of recipe and or behavior change	Place where developed/ tried	Energy density (kcal/g) (Recommended value: ≥ 0.8 kcal/g ^a)	Number of $\frac{1}{2}$ cup ^b servings needed (serving size for 6–8-month-old infant)	Number of $\frac{3}{4}$ cup ^b servings needed (serving size for 9–11-month-old infant)	Number of 1 cup ^b servings needed (serving size for 12–23-month-old infant)
<i>Traditional recipes</i>					
Salt cracker gruel	Bassin Zim	2.4	0.7	0.7	0.9
Bread soup		0.87	1.9	1.9	2.6
Wheat flour gruel		0.9	1.9	1.9	2.6
Mashed plantain with fish sauce		2.1	0.9	0.9	1.2
<i>Modified recipes</i>					
Millet gruel with black beans and groundnuts	Bassin Zim	0.96	1.6	1.6	2.2
Wheat flour gruel with black beans and groundnuts		0.97	1.6	1.6	2.2
Millet snack (Cham-cham)		4.17	0.6	0.6	0.9
Wheat flour gruel with black beans and dried fish	Marmont	1.55	1.0	1.0	1.4
Wheat flour gruel with black beans and sugar		1.28	1.2	1.2	1.7
Mashed plantain with pumpkin and fish sauce		0.8	2.1	2.1	2.9
Wheat flour gruel with black beans, sugar, and oil	Tierra Muscadi	1.11	1.4	1.4	1.9
Mashed plantain with pumpkin and fish sauce		0.87	1.8	1.8	2.5
Addition of an egg to wheat flour gruel		1.36	1.0	1.0	1.3
CSB gruel with dried fish	Marmont	1.25	1.2	1.2	1.7
CSB gruel with dried milk and sugar		1.44	1.0	1.0	1.4
CSB fried snack (acra)		60 (serving size = 30g)	2.0	--	--

^a PAHO/WHO 2003.

^b Average serving sizes for children 6–8, 9–11, and 12–24 months were estimated during recipe trials to be $\frac{1}{2}$, $\frac{3}{4}$, and 1 cup, respectively.

All recipes, including nonenriched ones, meet the minimum requirement of 0.8 kcal/g. The salt cracker gruel has the highest energy density of all complementary foods (except the millet snack), while the bread soup, wheat flour gruel, and improved mashed

⁶ Mothers reported that, on average, 6–8-month-old infants usually consumed $\frac{1}{2}$ cup of the gruels or mashed plantain preparations; 9–11-month-old infants, about $\frac{3}{4}$ cup; and 12–23-month-old children, 1 cup. Based on these serving sizes and the energy densities of the different complementary foods, we computed the number of servings of each preparation that would need to be consumed by children of different ages to meet their daily energy requirements (Dewey and Brown 2003).

plantain preparations have the lowest energy densities. The original recipe of the mashed plantains with fish sauce is actually *more* energy-dense than the modified recipes. This is due to the larger amount of vegetable oil used to prepare the accompanying fish sauce in the original preparation in Bassin Zim, than in the modified recipes of the same dish prepared in Marmont and Tierra Muscadi. It may be advisable to retain the amount of fat used in the original recipe to increase the energy density of the improved recipe. It is important to remember, however, that higher energy density resulting from additional oil results in lower density of protein and micronutrients, and therefore the approach should be used cautiously.

The last three columns of Table 7 present the number of servings of each complementary food that would be required to meet the daily energy needs of infants and children 6–8, 9–11, and 12–23 months old, respectively. Note that all calculations presented in this table are based on assumptions of *average* energy intake from breast milk. As expected, gruels of greater energy density would require a smaller number of feedings per day, while the lower-density preparations would require greater feeding frequency. The salt cracker gruel, for example, which has the highest energy density, would need to be fed about once (0.7–0.9 servings, depending on age), whereas the bread soup, the wheat flour gruel, and the improved mashed plantain preparations, which are of lower energy density, would have to be fed 2-to-3 times/day. For all age groups, none of the preparations exceed the recommended feeding frequency, suggesting that, in general, the feeding frequencies required for children fed the current or improved preparations are not excessive. Thus, it appears that energy density of commonly fed complementary foods in this population is generally acceptable.

Given that the calculations of the number of required servings/days are based on average breast milk intake, it will be important to ensure that children who do not receive adequate amounts of breast milk are fed these foods more often. We do not have data on actual breast milk intakes in our study population, and further research would be needed to calculate the *exact* required intakes of complementary foods among children of different ages in this population.

Protein, Vitamin A, Iron, and Zinc Density

In addition to assessing energy density, it is important to evaluate the protein and micronutrient density of the complementary food recipes. In particular, vitamin A, iron, and zinc are critical micronutrients for the growth, immunity development, and health of infants and young children. The micronutrient density of complementary foods is usually expressed in terms of amount of the micronutrient per 100 kcal of the complementary foods. Table 8 provides the average densities of selected nutrients in the recipes, compared to the average recommended micronutrient densities of the recipes. This is done only for infants 6–8 months of age for illustrative purposes.

The data show that the protein density of all preparations more than met the recommended density for 6–8-month-old infants. The modified recipes have a higher protein density than the recipes of the foods that are currently fed. The mashed plantain dishes have the lowest protein densities compared to the gruels, except in Tierra Muscadi, where the group had used more dried fish than in the other groups. The highest protein density was achieved by the addition of an egg to the wheat flour gruel. This gruel was also high in vitamin A because of the addition of the egg. Preparations that contained even small amounts of pumpkin added to the mashed plantain also achieved the desired vitamin A density. The use of CSB, a vitamin A-fortified donated cereal product, is also an excellent alternative to increase the vitamin A density of complementary foods. As shown in Table 8, all three preparations using CSB were more than three times higher in vitamin A density than recommendations for this age group. Additional approaches to ensure adequate vitamin A density of complementary foods in this population include adding some type of liver to the diet and promoting intake of noncitrus orange-colored (vitamin A-rich) fruits when they are in season.

Iron and zinc densities—known to be “problem” nutrients in infants and young children in developing countries who are fed nonfortified foods—are tremendously inadequate in all our recipes, whether traditional or improved. Although adding an egg to

Table 8—Summary of the nutrient densities of currently fed complementary foods and of modified recipes (only for 6–8-month-olds)

Name of recipe and or behavior change	Place where developed/ tried	NUTRIENT DENSITIES (amount of nutrient/100 kcals of recipe)			
		Protein (g) recommended ^a : 1 g/100 kcal	Vitamin A (RE) recommended ^a : 31µ g/100 kcal	Iron (mg) recommended ^{a,b} : 7.5 mg/100 kcal	Zinc (mg) recommended ^a : 1.6 mg/100 kcal
Traditional recipes					
Salt cracker gruel	Bassin Zim	1.58	0	0.93	0.14
Bread soup		2.5	13.02	0.72	0.05
Wheat flour gruel		1.55	0.03	0.41	0.13
Mashed plantain with fish sauce		1.08	0.66	0.16	0.05
Modified recipes					
Millet gruel with black beans and groundnuts	Bassin Zim	2.77	0.12	1.35	0.18
Wheat flour gruel with black beans and groundnuts		2.41	0.12	0.50	0.26
Millet snack (Cham-cham)		3.09	0	1.08	0.25
Wheat flour gruel with black beans and dried fish	Marmont	3.66	0.19	0.61	0.35
Wheat flour gruel with black beans and sugar		2.63	0.17	0.68	0.28
Mashed plantain with pumpkin and fish sauce		1.74	46.2	0.49	0.17
Wheat flour gruel with black beans, sugar, and oil	Tierra Muscadi	2.75	0.21	0.73	0.31
Mashed plantain with pumpkin and fish sauce		2.64	40.55	0.49	0.24
Addition of an egg to wheat flour gruel		3.94	42.55	0.86	0.34
CSB gruel with dried fish	Marmont	4.9	140.5	3.2	0.9
CSB gruel with dried milk and sugar		2.8	111	2.5	0.7
CSB fried snack (acra)		6.9	184	4.1	1.2

^a Recommended nutrient densities for 6-8-month-old infants who consume average amounts of breast milk are from Dewey and Brown (2003).

^b Assuming low bioavailability of iron (Brown, Dewey, and Allen 1998).

the wheat flour gruel almost doubled the iron and zinc content of the usual recipe, and adding dried fish to the wheat flour and bean gruel increased its zinc density, all modified recipes were still grossly inadequate relative to iron and zinc densities. The complementary foods made with the fortified food aid commodities had more iron and zinc than the other recipes. However, the iron and zinc density of these foods was only approximately half the recommended density (except for the zinc density of the *acra*, which was 80 percent of the recommended density. Thus, even recipes prepared with iron- and zinc-fortified CSB (5 mg zinc/100 g and 17.5 mg iron/100 g) failed to reach adequate density for these two nutrients. Note that the recommended iron densities used here were for diets low in bioavailable iron, because Haitian infants have a low intake of

bioavailable heme iron (from animal sources), an apparently low intake of promoters of absorption of nonheme iron such as ascorbic acid (because of their low intake of fresh fruits and vegetables), and a high intake of inhibitors of nonheme iron (e.g., phytates from plant-based foods).

Estimated Cost of Using Animal Source Foods to Fill the Iron and Zinc Gaps

To determine whether it would be feasible to promote increased intake of meat or liver to fill the iron and zinc gaps, we calculated the amounts of these products that would be required to allow young infants to meet their daily requirements of these nutrients. We selected 6–8-month-old infants for illustrative purposes, and assumed that they were consuming the selected gruels twice a day, which is the minimum recommended feeding frequency for this age group. We used the WHO-recommended daily intakes of iron and zinc for infants consuming average energy from breast milk (WHO 2002). The *absorbed* iron requirements of infants between 6 and 8 months are estimated to be about 1 mg/day, and the recommended intake of iron varies, depending on the bioavailability of the sources of iron in the diet (Dewey and Brown 2003). The recommended zinc intake for the same age group is 4.1 g/day (no correction for bioavailability is available). Since meats contain heme iron that is highly bioavailable (15 percent is absorbed) compared to cereals (only 5 percent is absorbed), calculating the amount of meat needed to fill the iron gap requires consideration of the differential amounts of iron absorbed from meat compared to the lower bioavailability cereal-based gruels.

Table 9 presents the amounts of beef and beef liver that are needed to fill the iron gap that remains after feeding children the enriched gruels made with either fortified food aid commodities or unfortified wheat flour. The calculations are made separately, depending on whether the meat products are fed at the same meal as the gruel or not (top and middle part of Table 9, respectively). The reason for making this distinction is that meat products have been shown to enhance the absorption of nonheme iron contained in plant-based foods when consumed at the same meal. Recent research has shown that red

meat enhances the absorption of iron from low bioavailability foods (5 percent absorption) to at least medium bioavailability (10 percent absorption) (Hallberg et al. 2003).

Table 9—Amounts of meat and liver that would need to be consumed by children ages 6–8 months to complement selected gruels fed twice a day

IRON (mg) ^a (if beef/beef liver are fed at a different meal than the gruel)					
Type of gruel/preparation	Amount of absorbed iron provided by gruel (if ½ cup is fed twice/day) ^b	Beef		Beef liver	
		Amount needed	Price (using prices for Hinche) ^c	Amount needed	Price (using prices for Hinche) ^c
	(mg)	(g)	(gourdes)	(g)	(gourdes)
CSB gruel with dried fish (salty)	0.52	106	11	52	7
CSB gruel with sugar and milk (sweet)	0.49	112	11	55	8
Wheat flour gruel with beans and dried fish	0.12	186	19	92	13
Wheat flour gruel with beans and sugar	0.11	188	19	92	13
IRON (mg) ^a (if beef/beef liver are fed at the same meal as the gruel)					
Type of gruel/preparation	Absorbed iron provided by gruel (if ½ cup is fed twice/day with 25 g beef/beef liver at each meal) ^d	Beef		Beef liver	
		Initial amount + additional amount needed	Price for <u>total</u> amount (using prices for Hinche) ^c	Initial amount + additional amount needed	Price for <u>total</u> amount (using prices for Hinche) ^c
	(mg)	(g)	(gourdes)	(g)	(gourdes)
CSB gruel with dried fish (salty)	1.04	50 + 0	5	50 + 0	7
CSB gruel with sugar and milk (sweet)	0.98	50 + 0	5	50 + 0	7
Wheat flour gruel with beans and dried fish	0.24	50 + 112	16	50 + 30	11
Wheat flour gruel with beans and sugar	0.22	50 + 115	16.5	50 + 32	11.5
ZINC (mg) ^e					
Type of gruel	Amount provided by gruel (if ½ cup is fed twice/day)	Beef		Beef liver	
		Amount needed	Price (using prices for Hinche) ^b	Amount needed	Price (using prices for Hinche) ^b
	(mg)	(g)	(gourdes)	(g)	(gourdes)
CSB gruel with dried fish (salty)	3.0	19	2	18	3
CSB gruel with sugar and milk (sweet)	2.6	26	2.5	25	3.5
Wheat flour gruel with beans and dried fish	1.36	47	5	45	6.5
Wheat flour gruel with beans and sugar	0.94	55	5.5	52	7.5

^a Absorbed iron requirements for infants 6-8 months old = 1.05 mg (calculated from iron intake requirements in Dewey and Brown 2003).

^b Exchange rate at the time of the study: US\$1 = 28 gourdes.

^c Assuming low bioavailability of iron (5 percent) from cereal-based foods.

^d Assuming increase in iron bioavailability from low (5 percent) to medium (10 percent) with the addition of red meat (Hallberg et al. 2003).

^e Recommended daily intake of zinc is 4.1 mg from complementary foods, assuming an average intake of breast milk (WHO 2002).

In all calculations, we use an iron requirement of 1 mg of *absorbed iron* (Dewey and Brown 2003). We assume a high bioavailability of iron from meat and liver (15 percent), a medium bioavailability (10 percent) from the gruel when consumed at the

same time as meat, and a low bioavailability (5 percent) from gruels consumed without meat products. Detailed calculations of the amounts of beef and beef liver that will be needed to fill the iron gap are presented in Appendix 2.

The findings presented in Table 9 show that infants fed improved gruel recipes made of fortified CSB would still need approximately 100 g/day of meat and half that amount of beef liver to close their iron gap (assuming meat is not consumed at the same meal as gruels). If nonfortified cereals such as wheat flour are used to prepare the gruels, almost twice that amount of meat or liver, i.e., about 200 g, would be required for infants to meet their daily requirements of absorbable iron. By contrast, only 50 g of meat or liver would be required if these products were consumed at the same time as the gruel, because of the absorption-promoting effect of meat on nonheme iron. It is important to remember that these substantial amounts of meat or liver would have to be consumed by the 6–8-month-old infant in addition to the two servings per day of ½ cup of enriched porridge—some of which already contain fish. It may be impossible to feed such amounts of foods to young infants who have limited gastric capacity. Moreover, the cost of meat products may be prohibitive. Even if mothers were to purchase only the amounts required for their 6–8-month-old infant, the cost of beef or beef liver would range from 5 to 20 gourdes (\$0.18–\$0.71). This may be affordable occasionally, but certainly not on a daily basis. Consuming the meat products at the same meal as other sources of nonheme iron would slightly reduce the cost, and especially so if donated fortified food commodities are used (these provide the double benefit of being fortified and free). This option may therefore be more feasible for beneficiary families, but again, under the conditions that meat and organ meats are readily available in the markets, that mothers are able to purchase them in small quantities, and that they are willing and able to use them only for their young infant.

Meeting zinc requirements through the addition of some animal products to the diet seems more feasible than meeting iron requirements, both in terms of amounts required and cost (amounts range between 19 and 55 g and cost 2–5.5 gourdes or \$0.10–\$0.20). These costs, however, are still significant for poor families, and thus alternative

or complementary solutions to enhance the iron and zinc content of young children's diets will have to be identified.

Overall, the results suggest that the constraints to meeting the iron and zinc requirements of young children in this population include price, availability, and feasibility. The economic constraint is a crucial problem, and it limits the ability of poor households to purchase even the relatively small amounts of the meat products required to feed their young infant, let alone their whole family. As demonstrated by our market study, the issue of availability is particularly severe for liver, which is often not available in small quantities. Finally, our calculations show that, although meat and liver could greatly contribute to improving intake of bioavailable iron and zinc, the amounts and frequency required to allow infants to meet their daily requirements are likely to be unfeasible from a gastric capacity point of view. Furthermore, there could be organoleptic constraints to feeding gruels and beef/liver at the same time, particularly at an age when infants are only beginning to experience different tastes and textures. Recipe trials combining donated fortified cereals such as CSB with meat or liver will be conducted to assess the acceptability, feasibility, cost, and potential contribution of meat-containing recipes. In addition, the feasibility of using dietary supplements and dispersible tablets, spreads, or sprinkles will be explored. These options may be more cost-effective, particularly among families that do not receive food assistance or cannot afford even small amounts of meat on a regular basis.

Sodium Content of Complementary Foods

The foods prepared for the infants and young children all contained extremely high levels of sodium. The recommended intake of sodium for infants under one year of age is only 80 mg/day (Fomon 1993), while all the foods prepared contained 690–2,050 mg of sodium per cup. The potential danger of excessive sodium in infants' foods is related primarily to its role in increasing their susceptibility to dehydration. However, the levels of sodium in the body also depend on other factors, such as water intake, and the

implications of the seemingly excessive levels of sodium in these Haitian infant foods will have to be further evaluated.

6. From Research to Action: Development and Use of a Decision Tool for Program Planning

This section discusses how the formative research data were used for program planning, focusing on the developing of a two-stage decision tool that was used simultaneously to summarize and organize the findings from the formative research and to engage program staff at all levels in World Vision Haiti in discussions related to program planning.

Stage 1: A Tool to Organize Formative Research Findings and Facilitate Decisionmaking

Program planning guides for the development of BCC programs (Dickin, Griffiths, and Piwoz 1997; WHO 1994; Favin and Griffiths 1999) typically advocate an analysis of factors that either constrain or facilitate adoption of the desired behaviors. Data on current practices and these factors are usually gathered using formative research. Favin and Griffiths (1999), in particular, recommend that program planners compare current practices to desired practices, and then to examine the factors that constrain or motivate the closing of the gap. Most program planning manuals do not, however, provide a comprehensive tool that can be used for this process of analysis or for communication and discussion with program staff.

Thus, to summarize the large amount of information gathered through the research, with the main goal of facilitating discussion and decisionmaking, our team developed a decision tool, which is presented in Table 10. Starting with the left column, the matrix first identifies a set of goals to be achieved, in this case for optimal breastfeeding and complementary feeding practices. For each goal, a number of optimal

Table 10—Infant and child feeding practices in Haiti compared to best practices, and constraints and opportunities for behavior change in Central Plateau

Goals	Practices to promote	Practices in Haiti	Facilitating conditions for behavior change	Issues that may affect capacity for behavior change
A. INFANT FEEDING FROM 0–6 MONTHS				
Exclusive Breastfeeding (BF)				
<ul style="list-style-type: none"> ➤ Ensure exclusive BF ➤ Prevent bacterial contamination 	<ul style="list-style-type: none"> ➤ Early initiation of exclusive BF (EBF) ➤ Feeding of colostrum ➤ BF on demand ➤ Avoidance of pre- and postlacteal feeds ➤ Using expressed breast milk if needed ➤ Avoidance of baby bottles 	<p><i>Positive</i></p> <ul style="list-style-type: none"> ➤ BF widely practiced ➤ Reported to be mostly on demand <p><i>Nonoptimal</i></p> <ul style="list-style-type: none"> ➤ Prelacteal and postlacteal liquids and gruels widely used ➤ Complementary liquids and foods introduced at a very young age ➤ Widespread use of baby bottles <p><i>Not enough information</i></p> <ul style="list-style-type: none"> ➤ Timing of initiation of BF^a <p>Colostrum use^a</p>	<ul style="list-style-type: none"> ❖ Experienced, successful, positive-deviant mothers (who EBF) exist in communities ❖ Positive-deviant mothers had received information from health agents, media, health center staff ❖ EBF moms report it is cheaper to EBF and child is healthier <p>No objection to use of expressed breast milk; some mothers do it, but training needed</p>	<ul style="list-style-type: none"> ➤ Water-based liquids and teas given to treat colic ➤ Gruels given because mothers need to leave home for work or other activities ➤ Mothers' time and employment constraints ➤ Mothers concerned about feeling too weak and depleted if they EBF ➤ Concept of "hot milk" (let cho) (prevents mothers from breastfeeding, but seems to be only in the short term) ➤ Use of expressed breast milk is rare, milk expression unknown in some areas
B. FEEDING PRACTICES FOR INFANTS AND YOUNG CHILDREN 6–24 MONTHS OF AGE				
Continued breastfeeding				
<ul style="list-style-type: none"> ➤ Ensure sustained, frequent, on-demand BF up to 24 months and beyond 	<ul style="list-style-type: none"> ➤ Continue to BF frequently and on demand ➤ Using expressed breast milk if needed ➤ Avoidance of baby bottles 	<p><i>Positive</i></p> <ul style="list-style-type: none"> ➤ Mothers traditionally continue to BF up to 24 months of age <p><i>Nonoptimal</i></p> <ul style="list-style-type: none"> ➤ Widespread use of baby bottles <p><i>Not enough information</i></p> <ul style="list-style-type: none"> ➤ Mothers may not always BF on demand because of need to leave home for work or other tasks ➤ Children whose mothers are frequently absent may not receive sufficient nutrients from breast milk 	<p>No objection to expression of breast milk, but training needed</p>	<p>No need for behavior change, but continue promotion of continued BF up 24 months and beyond</p> <p><i>Potential constraints to frequent, on demand BF</i></p> <ul style="list-style-type: none"> ➤ Mothers need to leave home to work or to markets ➤ Milk expression rarely practiced, unknown in some areas

^a These data were obtained from the baseline survey carried out in 2002 and are being analyzed.

Table 10 (continued)

Goals	Practices to promote	Practices in Haiti	Facilitating conditions for behavior change	Issues that may affect capacity for behavior change
Complementary Foods > Provide foods to complement breast milk and to allow adequate intake of energy and micronutrients	> Feed child special energy- and nutrient-dense foods of appropriate texture and consistency for age > From 6 months on, gradually increase amounts and quantity of foods as child gets older > Increase number of times child is fed CF as he/she gets older (at least 2-3 times/d for 6-8 mo old; 3-4 times/d for 9-24 mo old) > Feed a variety of foods (gradually increase variety with age); animal foods should be eaten daily, or as often as possible	Non-optimal: > Complementary foods (CF) of low energy and very low nutrient-density > Variety of foods seems low; animal foods consumed infrequently and in small amounts; low intake of vitamin A fruits and vegetables > Frequency of feeding is low (2-3 times/d) and does not seem to increase with age > Evening meal not fed to young children > No "special" complementary food for child; gruels are consumed by all family members	❖ No cultural barriers to feeding young children animal foods ❖ Mothers know that eggs, liver are good for child ❖ Mothers usually feed child when they are present ❖ Mothers leave prepared food for child when they have to leave ❖ Good recognition of importance of fluid replacement during diarrhea	> Lack of availability and access to food, especially animal-source foods and micronutrient-rich fruits and vegetables > Overall poverty, lack of economic resources > Poor access to water, sanitation, health services > Time constraints of caregivers to prepare "special foods" > Belief that evening meal causes indigestion > Lack of recognition of importance of high feeding frequency for young children > Belief that children are ready for family foods and family meal patterns by 12 months of age > Some cultural barriers to feeding young children specific fruits/vegetables
Feeding during diarrhea > Continue to BF and feed CF to child during diarrhea; ensure fluid replacement	> Increase fluid intake during illness, including more frequent breastfeeding, and encourage the child to eat soft, varied, appetizing, favorite foods. > After illness, give food more often than usual and encourage the child to eat more.	Positive practices: > Mothers continue to BF and give liquids when child has diarrhea Non-optimal practices > Mothers reduce feeding of CF during diarrhea	❖ Knowledge about fluid replacement can be used to introduce issues of encouraging consumption of food during and after an episode of illness and providing special foods for recuperation	
Responsive feeding > Practice responsive feeding, applying the principles of psychosocial care	> Feeding with a balance between giving assistance and encouraging self-feeding, as appropriate to the child's level of development > Feeding with positive verbal encouragement, without verbal or physical coercion. > Feeding with age- and culturally-appropriate utensils > Feeding in a protected and comfortable environment > Feeding in response to early hunger cues > Feeding by an individual with whom the child has a positive emotional relationships and who is aware of and sensitive to the child's characteristics, including his or her changing physical and emotional states.	Positive practices > Child is usually fed from a separate bowl or plate rather than common plate > Fathers seem involved in childcare and feeding Insufficient information Psychosocial care (must be assessed through observations, beyond scope of this study)	❖ Some aspects of responsive feeding are already practiced (e.g., feeding in a separate bowl, involving fathers in care)	

concrete practices to be promoted is listed (following the recently published Guiding Principles [PAHO/WHO 2003]). Current child feeding practices in Haiti (summarized in the previous section) are then contrasted with recommended practices (third column from left), highlighting both the positive and the nonoptimal practices observed. Facilitating factors and potential constraints to behavior change are presented in the next two columns.

For our research in Haiti, the matrix was translated into French and Creole and was used to summarize and discuss the results of the formative research and to facilitate discussions related to program options with program planners and program staff in World Vision. The summary of findings and implications for World Vision program is presented next, followed by a description of the second planning tool that was used to help translate research findings into programmatic actions.

Summary of Formative Research Findings and Implications for Programmatic Actions

Exclusive Breastfeeding for 0-6-Month-Old Infants. Breastfeeding is widely practiced in this population and appears to be on demand, at least when mothers are physically with their infants. However, the widespread use of complementary liquids and starchy gruels, often fed with a baby bottle to very young infants, raises serious concerns about the potential displacement of breast milk, the resulting nutrient inadequacy of the diet, and the excessive risk of contamination. The fact that positive-deviant mothers—i.e., those who exclusively breastfed—were identified in the communities where the study took place is encouraging. These mothers can be used as role models. Interviews with these positive-deviant mothers also helped identify potentially powerful arguments as to why exclusive breastfeeding is positive and beneficial. For example, these mothers reported that exclusive breastfeeding improved their infant's health and reduced their health-care costs. These ideas can be used to design effective, locally relevant messages to promote exclusive breastfeeding.

Some aspects that will need consideration, however, are the reasons mothers feel the need to feed their infants various teas and gruels. The BCC strategy will have to address, for instance, the concerns that mothers have regarding colic and the need to use teas to relieve it. Also, the fact that mothers and infants have to be separated to allow mothers to pursue their income-generating and other activities away from home has to be addressed carefully, because it was one of the main reasons reported by mothers for giving gruels to their very young infants. To overcome this constraint, it will be important to promote the practice of expressing breast milk and provide adequate training on how to do it. It may also be possible to encourage mothers who receive food aid through the program to delay their return to work after childbirth. Finally, another aspect that will need to be carefully addressed is the felt lack of energy and the weakness reported by mothers when they “breastfeed all the time,” and their use of liquids and foods to complement breast milk to obtain some relief. It is possible that the quality of maternal diet during lactation is poor, especially because of the cultural dietary restrictions imposed to mothers during the first few months postpartum, or that exclusive breastfeeding results in poor maternal nutritional status, fatigue, and low resistance to infections.

Optimal Complementary Feeding Practices from 6 to 24 Months and Continued Breastfeeding. Mothers in our sample report breastfeeding until the child is age 2 or more, as recommended. Complementary foods, however, are generally low in energy and nutrient density, and they include few micronutrient-rich foods, such as animal products, fruits, and vegetables. The frequency of feeding also appears lower than recommended throughout the 6–24-month period, probably due in part to the belief that evening meals cause indigestion in young children, as well as economic constraint. There also seems to be no recognition of the need to increase the number of feedings of complementary foods as infants age, and as the expected contribution of complementary foods to their nutrient requirements increases.

Although there appear to be no cultural barriers to feeding infants and young children animal-source foods such as eggs, fish, or meat, lack of availability of these foods appears to be a major constraint. This was confirmed through the interviews and market studies. Also because the need for “special foods” for the young child is not well recognized in this population, it is difficult for caregivers to conceive using these expensive products only for the youngest child when all members of the family eat the same meal. Many factors seem responsible for the lack of “special” complementary foods in this population. These include an apparent lack of knowledge of the specially high energy and nutrient needs of infants and young children, the belief that children are ready to consume family foods as early as 12 months of age, the time constraints of caregivers to prepare these special foods, and the lack of overall resources to purchase, prepare, and store these foods. The BCC program will have to find ways to overcome some of these factors, because they are likely to affect the ability of families to adopt the proposed behaviors. The program will also have to address the issue of the frequency and timing of feeding infants and young children. The program will need to provide more information to families about the need to feed infants and young children small, but frequent and nutrient-dense, meals and snacks, and it will have to identify alternative approaches to increase feeding frequency while taking into account the time constraints of caregivers and other family members.

Promotion of a Set of Enriched Complementary Foods Identified in Recipe Trials. The recipe trials documented the potential of various preparations to increase the energy and, more important, nutrient density of commonly fed complementary foods. The nutrient analysis of the modified recipes showed that both the salty and the sweet versions of the wheat flour gruel with beans had great potential to help infants and young children meet their energy requirements. If these preparations were fed between two and three times a day (depending on the age of the child and the recipe used), in average amounts ($\frac{1}{2}$ -1 cup, depending on age), infants and young children could meet their daily energy recommended intakes. Similar recipes prepared with donated commodities such as CSB

were promising alternatives because they were cheaper (only the added ingredients had to be purchased) and they increased the preparation's vitamin A, iron, and zinc density. Mashed plantain preparations with fish, prepared with extra oil (as in Bassin Zim), would also be appropriate to meet energy requirements if fed the recommended number of times at each age, but they were significantly more expensive.

Most of the improved recipes, however, fell short of meeting children's daily iron and zinc requirements. Because of the small amounts of fish used in the recipes that included fish, even these more expensive preparations did not allow young children to meet their high requirements for these micronutrients. The only situation under which it would be feasible to completely meet the iron and zinc requirements of infants would be with the feeding of small amounts of red meats, such as beef or beef liver, at the same meal as the gruels made using fortified CSB. Recipe trials will need to be conducted to test the feasibility, acceptability, and cost of gruel recipes made with CSB and some type of red meat or liver, or to develop other types of complementary foods that include both these products in the same meal. For vitamin A, the addition of an egg to the wheat flour or other gruel significantly improved its content of vitamin A and was not overly expensive. Similarly, using CSB instead of wheat flour increased the vitamin A density of the recipes to levels much higher than recommended.

Despite the fact that recipes including fish were more expensive than other preparations—and still did not fill the gap in terms of iron and zinc intake—the unique micronutrient and fatty acid composition of fish still makes it worth promoting, even if mothers can afford it only once or twice a week. Further ways to enrich the diet with bioavailable iron and zinc, such as promoting intake of some minimal amounts of meat or liver on a regular basis, will be explored further. That there are no cultural barriers to the use of meat or liver in young children's diets in this population should greatly facilitate behavior change; thus, efforts should focus on making these foods more available. Complementary approaches to increase micronutrient intake of infants and young children in this population should also be explored. The feasibility of using dietary

supplements such as dispersible tablets, spreads, or sprinkles will also need to be assessed.

Feeding During Diarrhea. Our findings showed that household management of diarrhea (including whether families seek care and what type of care they seek) is influenced by the type of diarrhea the child is thought to have. The BCC program will therefore have to emphasize the fact that *all* types of diarrhea need to be taken seriously. Families seem to be familiar with the concept of fluid replacement, and its importance should receive continued emphasis in the BCC program for all types of diarrhea.

Responsive Feeding. This study did not gather detailed information *how* children are fed—i.e., the psychosocial aspects of feeding, including feeding style, encouragement to eat, and quality of mother-child interactions during feeding. Gathering information on these aspects of child feeding would have required extensive observations in the homes during feeding episodes. It is important to note, however, that these aspects will be addressed in the development of the BCC intervention. Box 1 summarizes some best-practice feeding behaviors of importance from a psychosocial perspective (Pelto, Levitt, and Thairu 2003), which could be promoted through the BCC program.

Box 1
Best-practice feeding behaviors—from a psychosocial perspective

1. Feeding with a balance between giving assistance and encouraging self-feeding, as appropriate to the child's level of development.
2. Feeding with positive verbal encouragement, without verbal or physical coercion.
3. Feeding with age-appropriate, as well as culturally appropriate, eating utensils.
4. Feeding in a protected and comfortable environment.
5. Feeding in response to early hunger cues.
6. Feeding by individuals with whom the child has a positive emotional relationship and who are aware of and sensitive to the child's characteristics, including his or her changing physical and emotional states.

Source: Pelto, Levitt, and Thairu 2003.

General Perceptions about Child Health and Growth. In addition to the foregoing issues for the BCC program, there are also larger issues related to perceptions about child health and growth that the program can address. The research results suggest that families are very concerned about the vulnerability of babies and are actively trying to protect them during the first year of life. However, after the first year, mothers and other adults interviewed did not appear to perceive that the young child is still at serious risk of nutritional deficiency. Integrating young children into family meal patterns is a priority for rural Haitian families, possibly due to household resource and time constraints. The communication program will have to place a special emphasis on the need for continued attention to feeding frequency, types of food, and related caregiving behaviors for children ages 12–24 months. The follow-up research revealed that promoting the link between better care at this age and brain development could possibly motivate parents to provide extra care to children in this age group.

Stage 2: From Formative Research to Program Development—A Tool to Plan Programmatic Actions

The tool presented in Table 10 was particularly useful to summarize the formative research findings and served to encourage discussion about various program options to alleviate the constraints identified through the research as well as to sustain the facilitating factors. As a next step to the tool, we developed a program-planning matrix to systematically examine the programmatic actions that would be necessary to address each constraint or facilitating factor (Table 11). The consideration of feasible programmatic actions (presented in the second column) was based primarily on the existing World Vision program infrastructure and capacity (human, financial, technical). However, future needs and other supporting programs (particularly to support the BCC program) were also considered and these are presented in the third column of Table 11.

Table 11—Identification of programmatic options to address the constraints to infant feeding and to support facilitating factors

Constraints/facilitators to appropriate infant feeding	Program options within current structure and delivery system (BCC, food donations, and other interventions delivered by World Vision at rally posts, food delivery points, and mothers' clubs)	Program options that will require new program structure or complementary interventions
A. INFANT FEEDING, 0–6 MONTHS		
Exclusive breastfeeding		
Factors that constrain exclusive breastfeeding (EBF)		
<ul style="list-style-type: none"> ➤ Water-based liquids and teas given to treat colic 	<ul style="list-style-type: none"> ➤ BCC program: ensuring women are given enough knowledge and confidence about dealing with infant colic 	
<ul style="list-style-type: none"> ➤ Gruels given because mothers need to leave home for work (economic reasons) or other activities (mothers have multiple household responsibilities; time constraints) 	<ul style="list-style-type: none"> ➤ BCC program: training mothers in the use of expressed breast milk ➤ Food aid component (could aid in delaying extremely early resumption of work outside home) 	<ul style="list-style-type: none"> ➤ Microcredit programs targeting women and increasing their potential involvement in income-generating activities at (or close to) home ➤ Long-term poverty reduction strategies needed ➤ Public transportation and road improvement projects ➤ Childcare support
<ul style="list-style-type: none"> ➤ Mothers are concerned about feeling too weak and depleted if they EBF 	<ul style="list-style-type: none"> ➤ BCC program: can address need to replace fluids frequently when EBF ➤ Food aid component can possibly alleviate weakness due to poor quality diet and lack of food ➤ BCC program 	<ul style="list-style-type: none"> ➤ Fathers' clubs: ensure that fathers are sensitized to the need for EBF women to be supported. ➤ Agriculture production activities to increase availability/access to food
<ul style="list-style-type: none"> ➤ Concept of "hot milk" (prevents mothers from breastfeeding, but seems to be short-term) 	<ul style="list-style-type: none"> ➤ BCC program: ensuring adequate training in the use and appropriate storage of expressed breast milk 	
<ul style="list-style-type: none"> ➤ Use of expressed breast milk is rare; milk expression unknown in some areas 	<ul style="list-style-type: none"> ➤ BCC program: use mothers' clubs as support groups to encourage EBF 	
Factors that facilitate exclusive breastfeeding		
<ul style="list-style-type: none"> ➤ Experienced, successful positive-deviant mothers (who EBF) exist in communities 	<ul style="list-style-type: none"> ➤ BCC program: ensure that mothers receive the same information from different sources 	
<ul style="list-style-type: none"> ➤ Positive-deviant mothers had received information from health agents, media, health center staff 	<ul style="list-style-type: none"> ➤ BCC program: use benefits of EBF on household medical expenses as a motivator 	
<ul style="list-style-type: none"> ➤ EBF moms report it is cheaper to EBF and child is healthier 		
B. FEEDING PRACTICES FOR INFANT AND YOUNG CHILDREN, 6–24 MONTHS		
Continued breastfeeding		
Factors that constrain continued breastfeeding		
<ul style="list-style-type: none"> ➤ Mothers need to leave home to go to work or markets 	<ul style="list-style-type: none"> ➤ BCC program: promote and encourage continued and sustained breastfeeding up to 24 months of age 	<ul style="list-style-type: none"> ➤ Microcredit programs targeting women and increasing their potential involvement in income-generating activities at (or close to) home ➤ Long-term poverty reduction strategies needed ➤ Public transportation and road improvement projects ➤ Childcare support
<ul style="list-style-type: none"> ➤ Expression of breast milk rarely practiced 	<ul style="list-style-type: none"> ➤ BCC program: ensure adequate training in the use and appropriate storage of expressed breast milk 	
Factors that facilitate continued breastfeeding		
<ul style="list-style-type: none"> ➤ Mothers traditionally breastfeed up to 18–24 months 	<ul style="list-style-type: none"> ➤ BCC program: promote and encourage continued and sustained breastfeeding up to age 24 months 	

Constraints/facilitators to appropriate infant feeding	Program options within current structure and delivery system (BCC, food donations, and other interventions delivered by World Vision at rally posts, food delivery points, and mothers' clubs)	Program options that will require new program structure or complementary interventions
Complementary foods		
Factors that constrain feeding of optimal complementary foods		
<ul style="list-style-type: none"> ➤ Time constraints of caregivers to prepare "special foods" 	<ul style="list-style-type: none"> ➤ BCC program: promote easy-to-prepare, time-efficient recipes and ideas for nutritious CF 	<ul style="list-style-type: none"> ➤ Need for public transport and road projects that can ensure that women spend more time commuting to place of work ➤ Engage other family members (grandmothers, fathers, etc.) in BCC program to provide more support to mothers
<ul style="list-style-type: none"> ➤ Belief that evening meal causes indigestion 	<ul style="list-style-type: none"> ➤ BCC program: encourage feeding of gruels at night rather than juices or teas 	
<ul style="list-style-type: none"> ➤ Lack of recognition of importance of high feeding frequency for young children 	<ul style="list-style-type: none"> ➤ BCC program: ensure mothers are sensitized to higher feeding frequency needs of infants and young children 	
<ul style="list-style-type: none"> ➤ Belief that children are ready for family foods and family meal patterns by age 12 months 	<ul style="list-style-type: none"> ➤ BCC program: ensure that children age 12–24 months are given adequate attention and appropriate foods (use brain development as a motivator) 	
<ul style="list-style-type: none"> ➤ Some cultural barriers to feeding young children specific fruits or vegetables 	<ul style="list-style-type: none"> ➤ BCC program: encourage trials of small amounts of these foods 	
<ul style="list-style-type: none"> ➤ Lack of access to micronutrient-rich foods, especially animal foods and micronutrient-rich fruits and vegetables 	<ul style="list-style-type: none"> ➤ BCC program: encourage use of small amounts of meat, liver, or eggs for children ➤ Encourage consumption of goat milk (especially among goat owners) 	<ul style="list-style-type: none"> ➤ Livestock projects to increase access to animal-source foods ➤ Livestock care projects to improve health of animals and milk production ➤ Home garden promotion; solar drying of fruits/vegetables ➤ Microcredit programs to facilitate income generation through livestock rearing ➤ Market interventions to encourage sale of small pieces of meat and liver
<ul style="list-style-type: none"> ➤ Overall poverty, lack of economic resources 	<ul style="list-style-type: none"> ➤ Food aid component can help somewhat 	<ul style="list-style-type: none"> ➤ Overall community development projects and poverty reduction interventions ➤ Community development projects for improving water, sanitation, etc.
<ul style="list-style-type: none"> ➤ Poor access to water, sanitation, health services 		
Factors that facilitate feeding of optimal complementary foods		
<ul style="list-style-type: none"> ➤ No cultural barriers to feeding young children animal foods; mothers aware that eggs and liver are good for young child 	<ul style="list-style-type: none"> ➤ BCC program: encourage and support feeding of animal foods to young children 	<ul style="list-style-type: none"> ➤ Livestock projects and market interventions to increase availability and access to animal-source foods
<ul style="list-style-type: none"> ➤ Mothers leave prepared food for child when they have to leave 	<ul style="list-style-type: none"> ➤ BCC program: encourage preparation of enriched recipes rather than traditional low-nutrient density gruels/juices 	
Feeding during diarrhea		
Factors that constrain optimal feeding during and after diarrhea		
<ul style="list-style-type: none"> ➤ Feeding of CF during illness is decreased 	<ul style="list-style-type: none"> ➤ BCC program: encourage caregivers to continue attempts to feed children during illness ➤ BCC program: stress need for extra food and use of enriched recipes when children are recovering from illness 	
<ul style="list-style-type: none"> ➤ Good recognition of importance of fluid replacement during diarrhea 	<ul style="list-style-type: none"> ➤ BCC program: encourage caregivers to sustain fluid replacement with ORS and other safe fluids when child has diarrhea 	<ul style="list-style-type: none"> ➤ Community development projects for improving water quality and sanitation ➤ Ensuring availability of and access to ORS
Responsive Feeding		
Factors that could constrain responsive feeding		
<ul style="list-style-type: none"> ➤ Mothers' time and workload constraints 	<ul style="list-style-type: none"> ➤ BCC program: encourage mothers to entrust adult members and inform them about responsive feeding as well 	
Factors that facilitate responsive feeding		
<ul style="list-style-type: none"> ➤ Fathers seem involved in childcare and feeding 		<ul style="list-style-type: none"> ➤ Ensure that fathers are engaged in BCC program as well through fathers' clubs and sensitized to responsive feeding practices
<ul style="list-style-type: none"> ➤ Mothers usually feed child when they are present 	<ul style="list-style-type: none"> ➤ BCC program: encourage responsive feeding and encourage mothers to entrust adult members to feed child when possible 	

Programmatic Actions within Current World Vision Program Structure

An examination of the programmatic options to address the constraints and facilitating factors in the second column shows that most of the constraints brought up in the formative research study can be addressed through the BCC arm of World Vision's program. For example, the BCC program can address issues such as

- Ensuring that all lactating women with infants ages 0–6 months receive information and training on expressing breast milk and using expressed breast milk rather than gruels when they leave the house to go to work;
- Ensuring that women are given enough knowledge and confidence about dealing with infant colic in the early months;
- Ensuring that lactating women receive adequate information on the need to be well hydrated so that they do not feel tired when they are exclusively breastfeeding;
- Promoting and teaching women about easy-to-prepare, time-efficient recipes for nutritious complementary foods, using a cooking trial approach;
- Encouraging the feeding of animal foods such as meat, egg, liver, and fish to young children.

Other constraints, such as mothers' concerns about weakness due to a lack of food when lactating, are likely to be addressed through the food aid arm of the program.

The Need for Other Programs to Support the BCC Component

The third column in Table 11 presents some considerations for programmatic actions that can be taken by World Vision in the future. Some of these involve making fairly small adjustments and additions to the existing program structure, e.g., setting up fathers' clubs to sensitize fathers to issues such as the need for lactating women to have support from them and the nutritional needs of young children. Other options require more technical assistance, collaboration with other organizations, and possibly more

funding, e.g., setting up microcredit programs for income generation through home-based activities, livestock distribution and care programs, agricultural production programs, and programs that provide working women with childcare support.

One reason for including programs such as livestock care programs or small animal microcredit projects is that they can provide families with resources that enable them to act on the knowledge that they will gain through the BCC arm of the program. The research on the impact of behavior change programs and on the mechanisms by which maternal education affects child outcomes suggests that knowledge is often not sufficient to ensure adequate improvements in nutrition, health, and development. Rather, the *interaction of knowledge with resources* leads to the largest positive effects on child health (Ruel et al. 1992). Thus, to maximize potential impact on child health and nutrition outcomes, integrated programs should be implemented that address behavior change in conjunction with programs that increase household and caregiver access to resources such as food, money, and time. All three of these resources are critical to ensure that caregivers and families are equipped to utilize the knowledge that can be imparted by a successful BCC program.

The provision of resources to support translation of knowledge into behaviors and child outcomes can be achieved by a variety of supporting program activities. Some examples include

- Provision of microcredit programs to increase resource availability within households and communities, particularly through income-generation projects that allow breastfeeding women to stay home and earn an income.
- Promotion of food-based interventions to increase the production and intake of micronutrient-rich animal foods and fresh fruits and vegetables; explore the possibility of using some preservation techniques, such as solar drying, to extend the life of micronutrient-rich fruits and vegetables beyond their season of high availability.

- Initiation and support of community childcare initiatives to assist working parents with childcare responsibilities. This type of initiative may also become a source of income for those mothers who would run the daycare centers. Other initiatives could include identifying a safe spot in markets where other adults could take care of young infants when mothers are attending to their markets. This would facilitate exclusive breastfeeding among market women with young infants.
- Set up programs to engage other caregivers (such as fathers and grandmothers) in the BCC arm of the project. This will ensure that the entire household is targeted, not just mothers; it also ensures that other caregivers feel valued by the program.

The third column in Table 11 also presents programming needs related to a few underlying constraints that the current World Vision program cannot address: overall rural poverty, lack of water and sanitation facilities, poor roads, and a lack of public transportation. These are overall community and rural development programs that need concerted support from the Haitian government or other multisectoral collaborators. They have been included in this list so as to ensure that these underlying constraints are recognized both in the process of future program development as well in later program evaluations.

7. Conclusions

Our experience with the use of formative research for program design proved extremely useful, especially for identifying priority areas of intervention that could be addressed within current program structure. The decision tool developed as part of the study helped provide structure to the large amount of data gathered, and it allowed presenting the information in a systematic, clear, and easy-to-grasp manner. The tool also proved valuable in discussions related to program planning with World Vision-Haiti staff at all levels, as it helped build consensus and set priorities for action in the short and long term.

In the present situation, the tool was used after World Vision's five-year program cycle had been established. This limits the flexibility of the program to design interventions that are outside of their current mandate. In the future, formative research and the type of decision tool developed in this study should be used to plan forthcoming program cycles. This would help ensure that constraints to behavior change are addressed through appropriate programmatic interventions, even if these may be outside of the usual scope of activity of the implementing agency.

**Appendix 1:
Summary of Guiding Principles for Complementary Feeding
of the Breastfed Child⁷**

- 1. DURATION OF EXCLUSIVE BREASTFEEDING AND AGE OF INTRODUCTION OF COMPLEMENTARY FOODS.** Practice exclusive breastfeeding from birth to 6 months, and introduce complementary foods at 6 months while continuing to breastfeed.
- 2. MAINTENANCE OF BREASTFEEDING.** Continue frequent, on-demand breastfeeding until 2 years or beyond.
- 3. RESPONSIVE FEEDING.** Practice responsive feeding, applying the principles of psychosocial care: (1) feed infants directly and assist older children when they feed themselves, being sensitive to their hunger and satiety cues; (2) feed slowly and patiently, and encourage—but do not force—children to eat; (3) if children refuse many foods, experiment with different food combinations, tastes, textures, and methods of encouragement; (4) minimize distractions during meals if the child loses interest easily; (5) remember that feeding times are periods of learning and love—talk to children during feeding, with eye-to-eye contact.
- 4. SAFE PREPARATION AND STORAGE OF COMPLEMENTARY FOODS.** Practice good hygiene and proper food handling by (1) washing caregivers' and children's hands before food preparation and eating, (2) storing foods safely and serving foods immediately after preparation, (3) using clean utensils to prepare and serve food, (4) using clean cups and bowls when feeding children, and (5) avoiding the use of feeding bottles, which are difficult to keep clean.

⁷ Source: PAHO/WHO 2003.

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

6. FOOD CONSISTENCY. Gradually increase food consistency and variety as the infant gets older, adapting to the infant’s requirements and abilities. Infants can eat pureed, mashed, and semisolid foods beginning at 6 months. By 8 months, most infants can also eat “finger foods” (snacks that can be eaten by children alone). By 12 months, most children can eat the same types of foods as the rest of the family (keeping in mind the need for nutrient-dense foods, as explained in below). Avoid foods that may cause choking (e.g., nuts, grapes, raw carrots).

7. MEAL FREQUENCY AND ENERGY DENSITY. Increase the number of times that the child is fed complementary foods as he gets older. The appropriate number of feedings depends on the energy density of foods and the usual amounts consumed at each feeding. For the average healthy breastfed infant, meals of complementary foods should be provided two or three times per day at 6–8 months and three or four times per day at 9–11 and 12–24 months, with additional nutritious snacks (such as a piece of fruit or bread or chapati with nut paste) offered once or twice per day as desired. Snacks are defined as foods eaten between meals—usually self-fed, convenient, and easy to prepare. If energy density or amount of food per meal is low, or the child is no longer breastfed, more frequent meals may be required.

8. NUTRIENT CONTENT OF COMPLEMENTARY FOODS. Feed a variety of foods to ensure that nutrient needs are met. Meat, poultry, fish, or eggs should be eaten

daily, or as often as possible. Vegetarian diets cannot meet nutrient needs at this age unless nutrient supplements or fortified products are used (see below). Vitamin A-rich fruits and vegetables should be eaten daily. Provide diets with adequate fat content. Avoid giving drinks with low nutrient value, e.g., tea, coffee, or sugary drinks. Limit the amount of juice offered so as to avoid displacing more nutrient-rich foods.

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

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

Appendix 2:
Estimation of Amounts of Beef and Beef Liver Needed to Close the Iron Gap
for Infants Age 6-8 Months Who Are Fed Enriched Gruels

Table 12—Requirements for absorbable iron

	Percent absorption	Recommended iron intake (mg)	Absorbed iron requirements = recommended intake/percent absorption
High bioavailability	15	7	1.05
Medium bioavailability	10	10.9	1.09
Low bioavailability	5	20.8	1.04

Source: From Dewey and Brown 2003.

Table 13—Amounts of beef and beef liver needed to close the iron gap

(1) Amount of beef needed to close gap, if beef is <i>not</i> fed at same time as gruel					
	Iron content (mg)	Iron absorbed (low bioavailability)	Absorbed iron gap	Additional iron intake needed from beef	Beef needed to provide extra iron
Gruel	(A)	(B) = (A)*0.05	(C) = 1.05-(B)	(D) = (C)/0.15	[(C)/3.33]*100
CSB gruel with dried fish	10.4	0.52	0.53	3.53	106.11
CSB gruel with beans and sugar	9.8	0.49	0.56	3.73	112.11
Wheat flour gruel with beans and dried fish	2.4	0.12	0.93	6.20	186.19
Wheat flour gruel with beans and sugar	2.24	0.112	0.938	6.25	187.79
(2) Amount of beef needed to close gap, if 50 g beef <i>is</i> fed at same time as gruel					
	Iron content (mg)	Gruel iron absorbed * with added 50g of beef (medium bioavailability)	Absorbed iron provided by beef (high bioavailability)	Absorbed iron gap	Additional beef needed to close absorbed iron gap
Gruel	(A)	(B) = (A)*0.10	(C) = (3.33*0.15)/2	(D) = 1.05-(B+C)	[(D)/(3.33*0.15)]*100
CSB gruel with dried fish	10.4	1.04	0.25	-0.24	-7.20
CSB gruel with beans and sugar	9.8	0.98	0.25	-0.18	-5.40
Wheat flour gruel with beans and dried fish	2.4	0.24	0.25	0.56	112.05
Wheat flour gruel with beans and sugar	2.24	0.224	0.25	0.58	115.25
(3) Amounts of beef liver needed to close gap, if liver is <i>NOT</i> fed at same time as gruel					
	Iron content (mg)	Iron absorbed (low bioavailability)	Absorbed iron gap	Additional iron intake needed from liver	Liver needed to provide extra iron
Gruel	(A)	(B) = (A)*0.05	(C) = 1.05-(B)	(D) = (C)/0.15	[(D)/6.77]*100
CSB gruel with dried fish	10.4	0.52	0.53	3.53	52.19
CSB gruel with beans and sugar	9.8	0.49	0.56	3.73	55.15
Wheat flour gruel with beans and dried fish	2.4	0.12	0.93	6.20	91.58
Wheat flour gruel with beans and sugar	2.24	0.112	0.938	6.25	92.37
(4) Amounts of beef liver needed to close gap, if liver <i>IS</i> fed at same time as gruel					
	Iron content (mg)	Gruel iron absorbed with added 50g of liver (mg)	Iron provided by liver (mg)	Absorbed iron gap (mg)	Additional liver needed to close iron gap
Gruel	(A)	(B) = (A)*0.10	(C) = (6.77*0.15)/2	(D) = 1.05-(B+C)	[(D)/(6.77*0.15)]*100
CSB gruel with dried fish	10.4	1.04	0.51	-0.50	-49.28
CSB gruel with beans and sugar	9.8	0.98	0.51	-0.44	-43.34
Wheat flour gruel with beans and dried fish	2.4	0.24	0.51	0.30	29.93
Wheat flour gruel with beans and sugar	2.24	0.224	0.51	0.32	31.51

Note: Nutrient composition values for beef and liver were obtained from the USDA National Nutrient Database for Standard Reference Release 15 (available at <http://www.nal.usda.gov/fnic/foodcomp/Data/SR15/sr15.html>).

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