Maternal & Child Nutrition

DOI: 10.1111/mcn.12122

Original Article

Preventative lipid-based nutrient supplements (LNS) and young child feeding practices: findings from qualitative research in Haiti

Carolyn Lesorogol*, Sherlie Jean-Louis†, Jamie Green† and Lora Iannotti†

**George Warren Brown School of Social Work, Washington University in St. Louis, St. Louis, Missouri, USA, and †Institute for Public Health/Brown School of Social Work, Washington University in St. Louis, St. Louis, Missouri, USA*

Abstract

To prevent undernutrition in an urban slum in Haiti, a lipid-based nutrient supplement (LNS) was introduced through a randomised control trial. Food supplementation for young child nutrition has a long history in Haiti, but there is little empirical information regarding the effects of supplementation on young child feeding practices. One of the concerns raised by supplementation is that it may disrupt other positive feeding practices such as breastfeeding and use of other complementary foods, with negative consequences for child nutrition. We conducted 29 in-depth interviews with mother–baby pairs from the three comparison groups: control, 3-month LNS supplementation and 6-month LNS supplementation. Findings from those in the LNS groups indicated high acceptance and satisfaction with LNS and perceptions that it positively affects child health and development. LNS was integrated into and enhanced ongoing complementary feeding practices. The effects of LNS use on duration and perceived quantity of breastfeeding were variable, but generally, breastfeeding was maintained during and after the intervention. Interviews generated insights into beliefs regarding infant and young child feeding practices such as introduction and use of complementary foods, and breastfeeding duration, exclusivity and cessation. Implications for the use of LNS in public health nutrition programmes are discussed.

Keywords: Haiti, undernutrition, lipid-based nutrient supplements, qualitative research, infant and young child feeding practices.

Correspondence: Dr Carolyn Lesorogol, George Warren Brown School of Social Work, Washington University, 1 Brookings Drive, St. Louis, MO 63130, USA. E-mail: clesorogol@wustl.edu

Introduction

Undernutrition is a serious problem in Haiti where stunting affects 21.9% of children and acute diarrhoea affects one in three children under the age of 5 years (Cayemittes *et al*. 2007; MSPP 2012). In urban slum areas, environmental and economic conditions contribute to poor nutrition and morbidity as many families lack access to adequate, high quality food, clean water and sanitation (Garenne 2010). This study aimed to offset the economic and access barriers to high quality complementary foods by introducing a lipid-based nutrient supplement (LNS), the micronutrient fortified peanut butter paste Nutributter®, into the Ministry of Public Health and Population (MSPP) integrated package of well-baby services. Although food supplementation for young child nutrition has a long history in Haiti, there is little empirical information regarding the effects of supplementation on young child feeding practices. One of the concerns raised by supplementation is that it may disrupt other positive feeding practices such as breastfeeding and complementary foods, with negative consequences for child nutrition and health. Thus,

This article forms part of a supplement sponsored by Sight and Life. [This statement was added after original online publication]

the study aimed to better understand how LNS was perceived and used, how it was integrated into existing child feeding practices, and what changes in these practices occurred during and after the intervention.

Background: young child feeding in Haiti

Studies of infant and young child feeding (IYCF) in Haiti consistently report high rates of breastfeeding (96%) and mean breastfeeding duration of 18 months [Haiti Child Health Institute (HCHI) *et al*. 2006]. Rates of exclusive breastfeeding, however, are low; only 24% of 6 month olds are exclusively breastfed and early introduction of complementary foods and liquids is common [Haiti Child Health Institute (HCHI) *et al*. 2006]. Studies of IYCF confirm early introduction of complementary foods and liquids such as water, teas and flour-based gruels (Dempsey & Gesse 1983; Menon *et al*. 2003, 2005; Roman 2007; Dornemann & Kelly 2013). For example, many Haitians administer a pre-lacteal herbal and oil-based purgative (*lok*) postpartum to help expel the meconium (Dempsey & Gesse 1983; Roman 2007). Thereafter, water and teas are often fed if the infant cries excessively or is suffering from gas or colic (Menon *et al*. 2005). Complementary foods are also introduced to strengthen the infant and promote growth, to provide a respite to the breastfeeding mother, and in cases where the mother's breast milk is perceived to be insufficient (Roman 2007; Dornemann & Kelly 2013). Early complementary feeding increases the risk of child undernutrition through exposure to pathogens, stress on the digestive system, and under-provision of the nutrients and immune properties that breast milk supplies (Dornemann & Kelly 2013).

In addition, early introduction of complementary foods in Haiti draws attention to the reasons that exclusive breastfeeding is discontinued. Studies have identified women's perceptions of breast milk insufficiency as the predominant reason. On the one hand, insufficiency is attributed to the mother's poor diet quality and quantity (Roman 2007). On the other hand, insufficiency is sometimes attributed to a Haitian syndrome called *lèt gate*, which refers to breast milk becoming spoiled due to an emotional upset or shock causing an illness called *move san*, literally bad blood in the mother (Farmer 1988). One response to *lèt gate* is to wean the infant to avoid harm from the spoiled milk. Farmer reports, however, that most of his informants continued to breastfeed during *lèt gate* and that breastfeeding itself was often perceived as a necessary part of treatment for *move san*, helping to draw out the bad blood/milk and bring in the good (Farmer 1988).

Concerns about insufficient breast milk are widespread. Obermeyer & Castle (1997) contend that exclusive breastfeeding has been rare in many populations around the world. They argue that only severe malnutrition has been shown to limit women's biological ability to produce adequate breast milk (Whitehead *et al*. 1978), yet perceptions of insufficiency are much more common (Gatti 2008), stemming from issues related to gender roles, women's work demands, health messages and the availability of breast milk substitutes. Their research reveals that historical changes in breastfeeding practices mirror the relative valuation of breast feeding compared to formula feeding, the association of formula feeding with 'modernity', the presence and strength of social networks to support breastfeeding mothers, and shifting feeding recommendations from health personnel. These findings underscore the importance of contextualising child feeding practices within the broader historical, social and cultural milieu.

Key messages

- Lipid-based nutrient supplements (LNS) have high acceptability among Haitian mothers in an urban slum community.
- LNS did not disrupt positive child feeding behaviours including breastfeeding.
- Haitian mothers perceived health benefits for young children using LNS.
- Health messages about exclusive breastfeeding were received but not always followed.
- Urban poverty limits use of some nutritious complementary foods in Haiti.

Relative to breastfeeding, the literature on complementary feeding practices and contextual factors has been limited, especially with regard to Haiti. Prior studies have emphasised the need to understand more about complementary feeding behaviours and the underlying conditions, beliefs and attitudes that influence choices about complementary feeding practices (Pelto *et al*. 2003). The current study sought to understand how LNS interacted with ongoing IYCF including breastfeeding and use of complementary foods. Our interviews explored how LNS was incorporated into ongoing feeding practices, its cultural acceptability, whether and how feeding practices changed over the course of the intervention and the reasons for any changes that were made.

Materials and methods

Study site

This study was conducted in the Fort Saint Michel (FSM) Health Center of Cap Haitien, the second largest city in Haiti located in the far north of the country. FSM is in the poorest communal section of the city, Petite Anse, with a population exceeding 80 000. Many residents are recent migrants to the city from rural areas. It is a low-lying, densely populated area bordered by a small airport, a major road and a canal. During the rainy season, it is vulnerable to flooding due to the topography and lack of waste and drain-water infrastructure. Much of the housing is of poor quality, unfinished and lacking in sanitation, water and electricity. In Cap Haitien, there is one public hospital, two public clinics and other private health clinics. Well-baby services are primarily provided at clinics or rally posts, temporarily established locations in communities.

Recruitment to the study was open to all mothers with children less than 1 year from Petite Anse, and took place at the FSM clinic, rally posts and within communities over a period of 7 months, from May to December 2011. Eligibility criteria included the following: infant age between 6 and 11 months; in good health; not severely malnourished (weight-for-length z-score < -3); household not receiving other food aid; and residence within the FSM catchment area. Eligible mothers were informed of the study protocol and informed consent was obtained.

Study design

Children were assigned randomly to one of three groups: one received LNS supplementation for 6 months (group 3), one for 3 months (group 2) and one was a control group (group 1) that did not receive LNS. The child consumed one sachet of LNS (108 kcal) per day. At the end of the intervention, the control group received a full 6-month supply of LNS, and the 3-month group received another 3-month supply of LNS. Children and their mothers made monthly visits to the clinic at FSM hospital where they received LNS, children and mothers were weighed and measured, and mothers answered survey questions related to household demographics, use of LNS, child development and morbidity (Iannotti *et al*. 2014).

The qualitative research for the project has similarities with focused ethnographic studies (Pelto *et al*. 2013) in using a variety of qualitative methods to learn rapidly and specifically about IYCF practices in this population and responses to introduction of LNS with the aim of contributing to understanding intervention outcomes and future intervention design. In-depth interviews, focus groups and observations were conducted between November 2011 and March 2012. Unstructured observations were conducted in the FSM clinic for about 6 h by the qualitative research specialist over several days when women brought children for follow-up visits. The purpose of the observations was to see how the intervention was conducted and to observe mothers with their children, particularly noticing any feeding behaviours that occurred during their visits to the clinic. Field notes were recorded on these observations. Group interviews were held with FSM nurses and health agents and inquired into the services provided by that group of health staff and their experiences with the LNS programme. A matrix scoring exercise conducted with a group of 10 mothers of children participating in the LNS research project (Kumar 2002) focused upon identifying foods fed to infants and young children, discussing women's criteria for assessing the value of these foods, and then having the

women score each food against each criterion (details of this method are provided below).

Twenty-nine in-depth interviews were conducted with mothers of children enrolled in the LNS programme. Interviewees were selected purposively to include participants from all three groups in the intervention and across a range of socio-demographic characteristics. Interview guides were developed in English and translated into Haitian Creole, and interviews were conducted by the programme's qualitative research specialist and the study coordinator. Topics covered in the interview included the use, storage and perceived effects of LNS; breastfeeding and use of complementary foods; means of accessing food; sources of income and assistance from others; housing, water and sanitation conditions; use of health services; perceptions of health messages; and an elicitation of general needs. A sub-set of interviewees completed a pile sorting exercise grouping complementary foods by age of introduction and perceived nutritional value. Interviews were conducted in the women's homes and in a few cases included the women's husbands, partners or mothers who were present. The interviews ranged from 30 to 90 min, were digitally recorded, transcribed and translated from Creole into English for analysis.

Interview transcripts were uploaded into Nvivo10 qualitative analysis software and coded for themes. Themes clustered around the topics covered in the interviews, such as 'breastfeeding practices', 'complementary foods used', 'child feeding practices', 'community organization', 'economic issues', 'food production', 'health issues', 'perceived effects of LNS', 'project procedures and acceptability' and 'water and sanitation issues'. Each of these top-line themes was sub-divided into more detailed categories according to participants' responses in the interviews. Analysis of these categories and themes reveals patterns in the interview data that form the basis of the qualitative findings reported here. The results presented here derive primarily from the interviews with mothers and the matrix scoring exercise. Observational data confirmed some of the interview findings, particularly regarding types of complementary foods used. A framework matrix analysis of a subset of 12 interviews across the study arms analysing eight key themes did not demonstrate any systematic differences in responses across study arms. Mothers in the control group, however, did not report on their use of LNS or its effects on their children since they had not yet received it. Therefore, results are pooled for presentation below and variations reported reflect individual differences or overall patterns rather than differences across study arms.

Results

Demographic characteristics of interviewees

According to the study's baseline data, mothers selected for participation in the qualitative research were representative of the larger sample in socio-economic and demographic characteristics. Of the 29 mothers interviewed, 8 were in the control group (29.6%), 10 were in the LNS 3-month group (29.6%) and 11 in the LNS 6-month group (40.7%). Slightly higher representation from the LNS groups was necessary since many questions pertained to implications of the food on IYCF. The median number of household members was 5.5, and 6 (22%) of the children were first-born children. Levels of maternal education were similar to the overall sample: 23% had no education; 46% finished primary school; 27% secondary school; and 4% beyond secondary. Over half of mothers worked (65%), primarily in marketing, trading and selling goods. Average income in this sample was US $4.46 per day.

Storage and use of LNS

Overall, interviews with mothers indicated a high degree of acceptability of LNS as a complementary food that they used in conjunction with other IYCF practices. Women reported storing the LNS sachets in a safe, clean place such as a thermos, covered container or in a bag or purse. They tried to keep the LNS away from insects, rats and other people. For example, one woman commented that she kept the LNS in a locked cupboard:

Interviewer (I): Can you explain about the LNS, like how you used it, where you kept it, how often you gave it to your child.

Respondent (R): I kept it in a locked space so no one could get into it (laughs). Each morning I washed a plate in a bucket where I keep clean water and I mixed an egg and a banana and LNS. (Interview 08, Group 3)

Keeping the LNS in a locked cabinet helped ensure that it was protected from pests and that women controlled access to it. This comment is consistent with the vast majority of women's claims in both the qualitative interviews and the survey that they only fed LNS to the child enrolled in the study and did not share it with other children or with others outside the household.

Concerns about cleanliness and sanitation were raised frequently in the interviews, reflecting the challenges of an environment with poor or non-existent sanitation facilities and limited access to clean water. Women appeared quite conscientious about keeping the LNS clean and uncontaminated. This is facilitated by the fact that LNS does not require refrigeration and has a long shelf life. The convenience of having a food that was ready to use and did not require much preparation was commented upon by some women, as in the following:

R: When I wake up in the morning and have not made any food for my baby, I can give her LNS. When she wakes up and hasn't eaten anything, she starts crying. So I can give her a little LNS and a little water and she is satisfied. She will wait for me to make some food. This is a great experience for me to have a food that is already prepared. (Interview 03, Group 3)

Combining LNS with complementary foods

Most women fed children LNS twice a day, in the morning and later in the day. Almost all reported feeding LNS mixed with other types of food, as is common practice for child feeding more generally in Haiti (Menon *et al*. 2005). A range of different foods were mixed with LNS; mixing LNS with eggs or banana was common:

R: You can buy one banana, you can buy one [hard boiled] egg, and mix them with the peanut butter and give it to the child with some good juice and it's enough for the child. (Interview 08, Group 3)

More varied mixes were also reported:

R: I open the LNS packet and sometimes give just the LNS or I mash bananas and mix it with the LNS. If I have juice, I give her carrot juice or lime juice after the LNS. I also give her LNS with crackers, I give it with bread. (Interview 13, Group 3)

R: I mixed it with other foods like cheese. I also give it with eggs or put it on bread. (Interview 10, Group 3)

R: I mixed it with bananas. Also, I put it in porridge for him, a porridge of flour and milk. I also put it on bread. (Interview 09, Group 2)

Thus, LNS was combined with many of the common complementary foods used by women in this area such as bananas, eggs, processed soft cheese, porridge, bread, crackers and milk. The fact that women mixed LNS with other foods facilitates complementary feeding because LNS was added to other foods rather than replacing them. A couple of women did report feeding LNS alone, but this was unusual and may indicate a lack of resources to purchase additional complementary foods. Indeed, one of the women who reported feeding LNS straight also told us that she was continuing to breastfeed for 2 years because she did not have money to stop breastfeeding, indicating serious economic distress. The reliance on breastfeeding in the absence of money to purchase other foods is an issue we return to below.

LNS vs. peanut butter

Most women reported that their children enjoyed eating LNS and ate all that they were offered. One or two indicated that their child did not like the LNS the first time it was offered, but after a couple of tries, they developed a taste for it. LNS has the consistency and flavour of sweetened peanut butter. We asked women if they normally fed their children peanut butter, such as that available for sale in markets. Almost without exception, women said they did not feed peanut butter or consume it themselves. One woman explained that it is difficult to find peanut butter in Cap Haitien:

R: No. It's not easy to find good peanut butter here. Maybe in the countryside it's easier to find it, but not here.

I: Is peanut butter expensive?
R: It's expensive. It's 75 gourde (1.88 USD) for a small jar. (Interview 08, Group 3)

Consumption of ordinary peanut butter appears low, perhaps due to lack of supply and high prices. When asked if they would purchase LNS, many women responded that they would buy it if they could afford it. However, they emphasised that they would prefer to buy it from the health centre, not in the market. Their responses suggested a lack of trust in the quality of products they find in the market:

R: No, they stopped the program, so I won't give him anymore because all my *mamba* [LNS], the nurses stopped giving and I won't buy peanut butter outside to give the baby. It's not really expensive, but I don't want to give him something that's too strong, something that can expire. If it's the hospital that gave him something, I know it's not expired and I can give it to him. (Interview 08, Group 3)

This exchange indicates the suspicions women have of buying LNS in the market:

I: You've seen them walking in the market with it?
R: Yes, people walk around with it.
I: Have you bought it?
R: I've never bought it. If I found it in the health center, I would buy it. But I haven't found it to buy there, so I don't use it.
I: Why don't you buy it on the street?
R: Well, if it's not being given in the health center, you don't know who they are sharing it with, where they got it. (Interview 14, Group 1)

It appears that some of their confidence in LNS stems from its delivery through the programme and FSM clinic, both of which are generally highly regarded by the women. When asked if they would purchase LNS in the market, most women were sceptical of the safety or advisability of doing so.

Perceived health effects of LNS

The positive assessment of LNS includes perceptions that it contributes to child health and development. When asked what they liked about the LNS programme, most mothers pointed to positive health and developmental signs in their children:

R: Yes, I noticed that he is developing well. He is walking, he's talking. The peanut butter has helped him develop well. (Interview 10, Group 3)
R: The program was good for me because it helped my baby. It's really good because she was not sick when she was teething and it is still good because my baby is still healthy. It has helped us in many ways. The peanut butter was good for her. (Interview 12, Group 3)

Some of these associations of LNS with positive growth, health and development may stem from the fact that women were asked survey questions about health and development during each visit when they received LNS. They were also told at the outset of the programme that LNS contained important vitamins and nutrients that children need for healthy development. Thus, much of the messaging around LNS emphasises the health benefits of its use, and women's comments indicate that they have internalised this perspective on LNS. Furthermore, it may be the case that women consider LNS partly as a food product and partly as a medicine. This association could help explain their reluctance to substitute ordinary peanut butter for LNS or to purchase LNS in the marketplace. Their trust in the programme and its staff contribute to their confidence in the product, but that trust does not extend to other venues where LNS could be made available, such as shops or markets, where its medicinal value may be more suspect, from the women's point of view.

LNS and breastfeeding frequency

As noted earlier, in Haiti exclusive breastfeeding tends to be of short duration as complementary foods are often introduced within 1 or 2 months of birth. One of the concerns of the LNS intervention study was that providing a complementary food might reduce breastfeeding with negative effects on child health and nutrition. We were also interested to learn more about breastfeeding perceptions and practices among this urban poor population.

Although the quantitative data found a reduction in reported breastfeeding frequency in the group that received LNS for 6 months, the interviews indicated

that almost all women continued to breastfeed throughout the intervention. There was some variability in their accounts regarding the amount of breastfeeding with some claiming they breastfed a little less (the baby was not as hungry), whereas others said they breastfed more (the baby had a better appetite). It is important to note that most children in the study were between 1 and 2 years, when ending breastfeeding is the norm. Thus, some of the changes in breastfeeding were likely due to age and achievement of developmental milestones, not the addition of LNS to the diet.

The following comments illustrate the range of responses regarding continuation of breastfeeding during and after the introduction of LNS. First is an example of a woman reporting that breastfeeding increased while the child was receiving LNS:

I: Did you breastfeed more or less?
R: I breastfed more. He breastfed well. (Interview 06, Group 3)

Another woman reports increased appetite in the child leading to more breastfeeding in addition to the LNS:

R: . . . I breastfed more often because the LNS gave my baby more of an appetite. (Interview 19, Group 3)

Many women responded similarly to this mother who reports continuing to breastfeed about the same amount after beginning the LNS programme:

R: I still breastfeed the same way because my son breastfeeds a lot. I still breastfeed. (Interview 20, Group 2)

In contrast, the following mother explains that she reduced breastfeeding during the LNS intervention because the child requested it less:

R: When I started giving her LNS, she liked it because it is sweet. She started drinking less breast milk. (Interview 03, Group 3)

The same woman explains how breastfeeding increased after the end of LNS supplementation:

R: When I put the LNS in the milk, she drank it better. Now, she doesn't have the LNS. The milk is not sweet like that anymore. So now she doesn't drink milk as much. So I have to breastfeed more now.

In this case, the mother was dissolving LNS into milk formula for the baby. Once she stopped adding LNS to the formula, the baby did not want the formula as much, so she increased breastfeeding. The following exchange also shows the modulation of breastfeeding during and after LNS supplementation:

R: While he was eating the LNS, he drank more water, but he did not breastfeed a lot.
I: Now, he has not had LNS for 6 months. Do you still breastfeed the same way or . . . ?
R: I now breastfeed more. (Interview 07, Group 2)

The general pattern emerges that women continued to breastfeed during and after LNS supplementation, but the amount of breastfeeding was variable and contextual.

Factors that influence breastfeeding cessation

Almost all the women interviewed claimed that they would continue breastfeeding beyond 1 year and, in many cases, up to 18 months or 2 years. The uniformity of responses on this issue seemed to confirm a belief that prolonged breastfeeding is beneficial for children, as reported in other studies [Haiti Child Health Institute (HCHI) *et al*. 2006]. Responses such as the following were typical:

I: How long do you think you'll continue breastfeeding?
R: Two years. (Interview 15, Group 2)
I: How many months did you breastfeed your children?
R: For two years.
I: Why did you breastfeed for that long, for two years?
R: I know to breastfeed for that long. (Interview 10, Group 3)
R: My first child finished breastfeeding at twenty-four months. But my second child didn't breastfeed for two years, he breastfed for eighteen months. (Interview 20, Group 3)
R: Normally I breast feed my babies, I am always happy to do that. Some people tell me that I should stop the breast feeding after they got six months old, but I don't agree with them. I will stop when he is a year old. (Interview 26, Group 2)

There was also considerable consensus about the factors that influence decisions to stop breastfeeding.

In general, once a child is walking and has teeth, they are considered able to consume the same foods as other family members and breastfeeding can be reduced and ended. Of course, the timing of these milestones varies, and the interviews indicated a range from 1 to 2 years for reaching these milestones. Furthermore, weaning might be delayed if the child is sick, teething or due to the season. Athough these norms were clear in women's responses, there was variability in practice according to individual preferences, women's responsibilities and among children.

These remarks represent the connection between developmental milestones and weaning timing:

R: After 18 months I will stop breastfeeding. But my child isn't 18 months old yet. He doesn't walk yet, he doesn't have teeth yet. When he's 18 months, I won't give him breast milk anymore. My baby is only 12 months old now. (Interview 08, Group 3)
R: I planned to breastfeed for 18 months. But I'm not sure because I was waiting to see when she would start walking. They say if the child hasn't started walking yet and if they can't eat big foods because they don't have all their teeth, then breast milk can still support the baby. But my baby has started walking but she doesn't have all her teeth yet. So I think I will stop breastfeeding at the end of this month. (Interview 01, Group 1)

These mothers are making weaning decisions by comparing the development of their child with the norms about appropriate development milestones for weaning. Once the milestones are met, the women plan to stop breastfeeding.

The next exchanges show how seasonal factors figure into the weaning decision:

I: So you keep on breastfeeding him, when are you going to stop?
R: He is biting my breast now, I could stop but it is cold season now I have to keep on during that.
I: Some mothers don't want to do that in this particular season, why?
R: Because when it's cold the baby is searching for heat in his mother's body, that's why.
I: If the baby is searching for his mother's breast after she has stopped the breast feeding what could happen?
R: They say that he could have diarrhea. Some other people take their kid to their grandmothers so they could forget about the breast feed.
I: So now you are just waiting for the cold season to be over, when it is going to be hot what you going to do?
R: Since he is well developed, he almost walks so I have plenty reason to stop. (Interview 26, Group 2)

Teething and its associated illnesses can also delay weaning, as this mother explains:

R: . . . I am waiting until he has all his teeth. When he is sick, he will not eat at all. So I am waiting to stop breastfeeding until these teeth grow big, because sometimes his gums will become swollen and he won't eat.
I: Is he sick often? What kind of sickness does he get?
R: No, only when he is teething. When he is teething, he becomes sick a lot.
I: What does he get?
R: He gets diarrhea, he gets a fever. Everything. (Interview 21, Group 3)

Women's discussions of breastfeeding duration and weaning decisions are important because they underscore the positive associations that they have between breastfeeding and child health. It is clear from the interviews that women see breastfeeding as positive for children's health and they associate it with children's growth and achievement of developmental milestones.

Exclusive breastfeeding: perceptions, messages and practices

Although virtually all women breastfeed if they are able, exclusive breastfeeding for 6 months is much rarer. In the interviews, we explored women's perceptions about exclusive breastfeeding, the health messages they had received about it, as well as their actual practices. Most women reported that they had received health messages about the benefits of exclusive breastfeeding for 6 months. Comments such as the following were typical:

I: Why did you decide to give only breast milk for the first six months?
R: Because they told me that mother's milk is best for my baby from zero to six months, and not to give anything else. So I did this. (Interview 13, Group 3)

R: Yes because it was a doctor that told me this. They said when the child is little, you shouldn't give his food too early because he will not develop as well. When you give a child food at about six months, no matter what types of food you give, mother's milk still helps a baby develop. (Interview 22, Group 3)
R: It's good for children. It prevents children from having chest problems. It helps children grow. If you don't give her anything else, no water, no food, only breast milk, she will continue to grow. When I go to the clinic with her, she always has good weight on the scale. (Interview 23, Group 1)

Notably, the messages about exclusive breastfeeding for 6 months primarily come from health personnel, not from friends or relatives. In contrast, many women acknowledged that exclusive breastfeeding is more the exception than the rule, and they gave a variety of reasons why breastfeeding alone was insufficient for child nutrition:

R: Yes. People are used to this. For a long time, when a baby is born, you just give them food. So this is new for everyone, to breastfeed only for six months. It will take time to get people used to it. (Focus group_nurses)
I: Why did you start giving him bean sauce at three months?
R: I saw what other children were eating. I saw what other children were drinking. So this is what I did. (Interview 05, Group 2)
R: After two months I gave him food. I never could sleep at night because he had gas, so I bought something to take away his gas and I gave it to him. After a few days it finished and so I was obligated to give him food. That was why I started giving him food. (Interview 16, Group 2)

The first two comments indicate the normative nature of early introduction of complementary foods – it is common practice and women did it because that is what they observed other people doing. The third comment gives a specific health-related belief that when babies have gas they should be given special teas or drinks to treat it.

It appears that a very high proportion of women have received the health message that exclusive breastfeeding for the first 6 months is beneficial, whether or not they practise it. The women who had practised it were very positive about its benefits:

I: For these two children that you exclusively breastfed, and the first child that you did not exclusively breastfeed, what difference did you notice?
R: I saw a difference in their health. They didn't have problems with their teeth, they didn't have diarrhea. (Interview 25, Group 2)

Women who had not breastfed exclusively for 6 months were less likely to perceive health benefits from exclusive breastfeeding:

I: What are the differences when you were breastfeeding the baby and the time you feed him other food in his health condition?
R: It doesn't have any change at all. He used to suffer. When I start to give him Gerber and water, he doesn't feel the same way again. People say the breast feeding is not enough. I told them that it makes him better, he could receive different kind of protein from that and I also feed him other food. (Interview 27, Group 3)

This mother combined breastfeeding with complementary foods, seeing both as valuable. Her response reveals the perception that breastfeeding alone is often insufficient for maintaining child health. This may be due to the belief that women are not producing enough breast milk or that a child's behaviour and health problems call for additional foods. These beliefs seem to underlie the norm of introducing complementary foods early on, which, of course, may contribute to the very health problems people are trying to avoid and may also lead to less production of breast milk when breastfeeding is reduced. In some cases, women agreed that exclusive breastfeeding probably was the best practice, but explained that they had not been able to do so for a variety of reasons related to their or their child's health, thus circling back to the same emphasis on using complementary foods to cope with health problems.

Women's health and IYCF

In some cases, women's health is a reason for introducing complementary foods, as in the following exchange where a woman reports feeding baby food to her 8-day-old baby to compensate for her own weakness:

R: I knew it was good because after I gave birth, I wasn't eating much food and a baby will take a lot of energy from you and make you weak. So I had to give him Gerber. (Interview 17, Group 1)

She explains that she did not have enough food herself and used her limited resources to purchase food for the baby:

I: Is Gerber expensive?
R: Yes. It costs 25 gourde for one jar of Gerber. If I don't have money for Gerber I will buy crackers and sugar for five gourde . . . it's because I didn't have food for myself to breastfeed him. That's why I gave him food early.

In this case, the mother introduced complementary food to compensate for her (perceived) inadequate breast milk. Notably, her lack of resources may result in very poor quality complementary foods for the baby; in this case, sugary crackers replaced processed baby food when money was in short supply. On the other hand, we also heard reports of women relying more on breastfeeding in this same situation. When they lacked money to purchase food for the baby, they breastfed more:

R: If you don't have work [outside the home], you stay, you breastfeed until your husband comes. If you find a little work on the road, you make food to give the child . . . if you don't find work, you're obligated to stay home and breastfeed. (Interview 08, Group 3)
R: I don't have money to stop breastfeeding. So I'm obligated to continue breastfeeding until I have money. (Interview 15, Group 2)
R: When you're poor, you can't stop breastfeeding too early. When you're poor you don't have other food to give. We understand you have to continue feeding. When you're poor you have to continue breastfeeding. (Interview 11, Group 1)

These examples indicate that breastfeeding can be a last resort when families do not have enough money to purchase food. While it may be tempting to see this as a means to promote breastfeeding, it raises concerns since the mother's health may be put at risk if she is severely malnourished, which will ultimately have negative effects for the child. In addition, this association of breastfeeding with desperate poverty is not a positive one and may cast stigma on the practice of breastfeeding when it is done out of necessity rather than by choice. These comments also highlight the close connection that exists between household resources and child feeding practices.

Interestingly, only three women mentioned *move san* or *lèt gate*, and only one suggested that this played a role in her cessation of breastfeeding, which occurred after she returned to work in the market. Their definitions of these phenomena matched those in the literature, but they did not believe these to be common problems in this community or necessarily reasons to discontinue breastfeeding.

Breastfeeding messages re-interpreted

The value of exclusive breastfeeding is not the only message about breastfeeding that women have heard. Some of the other messages they report raise concerns about how health messages are interpreted and re-interpreted as they circulate in the population and the consequences this may have for child feeding practices. For example, some women reported hearing that breastfeeding after 6 months was of little or no value for the child. Indeed, the research team heard this message from one participant in a focus group who was a health agent. Some women had heard that after 18 months, breast milk could make the child sick; that the child could get worms from the mother's milk (also reported in Menon *et al*. 2005). The source of this idea was difficult to identify. In both of these cases, women tended not to put much stock in these ideas, particularly as they conflicted with their commitment to long-term breastfeeding.

Assessing the value of complementary foods: matrix scoring and pile sorts

As noted earlier, women feed young children a wide range of complementary foods, often introducing them within the first 3 months. In pile sort and matrix scoring exercises (see Table 1), women reported feeding infants less than 3 months old breast milk, water, Gerber® baby food, and porridge made of flour and cow's milk. It was fairly widely reported during the research, and in the literature (Dempsey & Gesse 1983; Menon *et al*. 2005; Roman 2007), that women

Table 1. Matrix scoring of 10 common complementary foods fed to babies from birth to 18 months, Cap Haitien, Haiti (November 2011)

	Nutrition (*Nitrisyon*)	Protect Baby (*Pwoteje bebe*)	Easy to find (*fasil pou jwenn*)	Easy for mothers (*fasil pou manman*)	Fast (*rapid*)	Quantity (*ase kantite*)	Baby likes (*bebe renmen*)	Low cost (*pa che*)
Crackers, milk and sugar (*bon bon let sik*)	1	0	4	5	5	2	5	5
Cow's milk (*let bef*)	5	5	5	5	3	1	5	2
Corn and beans (*mayi and sos pwa*)	5	5	2	2	0	1	5	0
Breastmilk (*let manman*)	5	5	5	3	5	1	5	5
Orange juice (*ji zoranj*)	2	5	4	5	5	3	5	5
Banana (*fig*)	2	4	5	5	5	3	5	5
Vegetables (*legim*)	5	5	2	1	1	1	5	0
Cheese (*fwomaj*)	5	5	5	5	5	2	5	5
Boiled eggs (*ze bouyi*)	5	5	2	2	4	2	5	2
LNS (*mamba*)	5	5	5	5	5	5	5	

Note: Foods were ranked by the participants on each criterion on a scale of 0–5, with 0 being the lowest ranking and 5 being the highest ranking.

prepare special teas for infants, to treat gas or colic. This probably accounts for the reporting of feeding water before 3 months of age. Between 3 and 6 months, the variety of complementary foods expands to include orange juice, rice with bean sauce, maize with bean sauce, soup, legumes, LNS, and both salty and sweet crackers. We observed children in the FSM clinic being fed packaged crackers and bottled juices. These are inexpensive and widely available. After 6 months, the diet of young children expands further to include plantains, bananas, cheese, eggs, milk formula and meat. By 12 months, children are considered able to eat from the family table and are offered the full range of foods consumed in the household including spaghetti, rice, potatoes, butter, carrots, yams, oil and so on. For women who reported exclusive breastfeeding for 6 months, the introduction of foods occurred at 6 months and resembled the lists of those who introduced foods earlier. Thus, by 6 months all children were considered able to consume a variety of complementary foods.

The matrix scoring exercise probed more deeply into the reasoning behind feeding practices. Women were asked to identify the ten most common foods fed to children from birth to 18 months. Then, they were asked to discuss the positive and negative characteristics of these foods to determine their perceived value across a number of dimensions. The criteria women identified included nutritional value, protects child (contains important vitamins), availability, ease of preparation, speed of preparation, palatability (for child), quantity (sufficient to supply adequate nutrition to the child) and affordability. Each food was scored on a scale of 0 to 5 (with 0 being low and 5 high) on each criterion. For example, crackers with milk were identified as one of the most commonly fed foods. It scored high in terms of accessibility, ease and speed of preparation, palatability and affordability. However, it scored low on nutritional and protective value. Thus, women understood that sugary crackers were not a healthy food for children, but the advantages of low cost, access, convenience and palatability

led to its widespread consumption. In contrast, vegetables (*legim*) were perceived to have high nutritional and protective values and to be highly palatable, but scored low in terms of access, ease of preparation and affordability. Similarly, a very common food eaten in Haiti, maize and bean sauce, scored high on nutritional value, protection and palatability but scored low on access, ease of preparation, speed of preparation and affordability. In these cases, nutritious and healthy options were deemed out of reach for many women due to high cost, lack of availability in local markets and inconvenience.

Foods that appeared to meet most of the criteria satisfactorily were bananas, processed cheese and eggs. Each of these items scored reasonably well on nutritional values and also scored well on access, convenience and cost. Not surprisingly, use of these foods was widely reported in the interviews. Breast milk itself scored high on all criteria, except that of 'quantity' echoing the perception that breast milk alone is not sufficient for child nutrition. The women were also asked to rate LNS according to the criteria (except for affordability which was not relevant since they were not required to purchase it), and it scored high on all criteria. This assessment of LNS matches women's comments in the interviews that LNS was high in nutritional value, convenient and easy to prepare, and highly palatable. Of course, in the absence of the LNS programme, availability and cost will become barriers to access.

Discussion

Information from interviews and the matrix scoring exercise converge to suggest that LNS has high acceptability among the women in the study and meets their criteria for a good complementary food. Virtually all of them agreed that LNS was a valuable addition to their child's diet, that it contributed to child development and was well-liked by the child. This accords with other recent studies in other world regions regarding acceptability of LNS (Flax *et al*. 2009; Adu-Afarwuah *et al*. 2010; Wang *et al*. 2013). LNS met women's criteria for a valuable complementary food, including convenience, palatability and high nutritional value. In contrast to some studies that find high percentages of participants feeding LNS alone (Flax *et al*. 2010), mothers incorporated the LNS into the child's diet by literally mixing it with common foods such as eggs, cheese, bananas, porridge, bread and crackers. Parker *et al*. (2011) reported mothers mixing LNS into porridge and occasionally into milk formula or serving it on bread. The timing of introduction of LNS corresponded with the interval in which the range of complementary foods increases, perhaps increasing the likelihood of integration of LNS with other complementary foods. This study enhances our understanding of the factors that influence mothers' choices of complementary foods, which is critical to evaluating the appropriateness of different supplementary foods (Sellen 2001).

The acceptability of LNS is bolstered by high levels of trust and satisfaction that women expressed regarding the LNS project specifically and FSM clinic more generally. It is possible that social desirability played a part in women's answers to questions about the acceptability of LNS, but the fact that most of them were hesitant to purchase LNS in the market due to concerns about quality and reliability underscores the positive association they have between LNS and the health delivery system. It is possible that women consider LNS to be partly a food and partly a medicine, as found in studies in Malawi that asked this question specifically (Flax *et al*. 2009). Further investigation is needed to confirm this interpretation and to explore the consequences in terms of longer term integration of LNS in local diets.

Evidence from interviews indicates that women continued to breastfeed during and after the LNS intervention. Breastfeeding frequency varied among women in the programme, sometimes increasing and sometimes decreasing, depending upon how the child responded to LNS supplementation and household access to other complementary foods. This study adds to our understanding of the factors that influence women's decisions to stop breastfeeding and introduce complementary foods (Pelto & Armar-Klemesu 2011). In particular, interviews show that these decisions are clearly linked to the achieve-

ment of child development milestones and influenced by illness, seasonality and household food security.

The matrix scoring exercise revealed that women in this community have numerous criteria for assessing the value of foods for young children. Nutritional value is an important criterion along with availability, ease of preparation, palatability and affordability. Given the high levels of poverty in this urban community, foods that are not available, affordable and easy to prepare tend to be eaten less, whereas cheaper foods with low nutritional value are fed more often. Women who lack resources to purchase food report relying more on breastfeeding as a last resort, which may stigmatise breast feeding to some extent.

Women's trust in health personnel was reiterated in their reports regarding health messages. Most health messages about child feeding, particularly about exclusive breast feeding, were reported as received from health personnel, in contrast to studies showing the influence of family members such as grandmothers in such decisions (Aubel 2012). This may be due to the urban setting in which many people are relatively recent migrants with small social networks often separated from family who remain in rural areas. In this situation, women are more reliant on health personnel for information. Although most women had heard that exclusive breast feeding for 6 months was recommended, relatively few had adhered to this practice for a variety of health and economic reasons, as discussed earlier. Furthermore, while health messages were received from health personnel, women also observed what others were doing and tended to follow those examples including early introduction of complementary foods. We also found that messages regarding the value of breastfeeding were mixed and sometimes misinterpreted.

This study's strengths include in-depth discussions with mothers about IYCF practices that yielded new information regarding behavioural factors related to use of LNS as a supplementary food. Further, it highlighted important criteria mothers use for valuing complementary foods which aligned with the LNS product. Limitations included a single time point for in-depth interview without the possibility to assess changes during the course of the intervention. Finally, the study relied on self-reported information rather than systematic observations of behaviour. Structured observations may be used to validate interview findings moving forward.

Conclusions and recommendations

Our findings support a number of recommendations for actions to support young child nutrition in Haiti. Firstly, LNS is highly accepted by mothers and well-integrated into complementary feeding practices with minor impacts on breastfeeding. Given the level of acceptability, we do not see cultural barriers to scaling up the availability of LNS for preventive purposes. Secondly, women exhibited a fairly high level of trust in the health system through which they received LNS. This finding lends support to the idea that the MSPP is an appropriate agency to deliver LNS supplementation provided that it is accompanied by adequate and appropriate screening, education and monitoring. Thirdly, understanding culturally specific beliefs and practices regarding breastfeeding and complementary feeding should inform health messages relevant to these behaviours. Ongoing discussion and dialogue with community members is needed to ensure that key health messages are received accurately, to correct misperceptions and to understand the facilitators and constraints to behaviour change. The level of trust women have for health workers can be enhanced through such engagement. Finally, additional programming and assistance may be needed to overcome constraints such as lack of availability, high cost and inconvenience of some highly nutritious foods.

Acknowledgements

The authors gratefully acknowledge funding from the Alive and Thrive Small Grants Program, University of California, Davis, The Inter-American Development Bank, The World Bank and The United Nations World Food Program.

Source of funding

Alive and Thrive Small Grants programme, University of California, Davis, The Inter-American Development Bank, The World Bank and The United Nations World Food Programme.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Contributions

CL participated in the conceptualization of the study, designed the interview guide, conducted interviews, analysed transcripts, and wrote and revised the text. SJ-L participated in the conceptualization of the study and design of the interview guide, conducted interviews and reviewed the text. JG participated in the conceptualization of the study, transcribed and translated interviews, and reviewed the text. LI participated in the conceptualization of the study, participated in interviews and other qualitative methods, and contributed to writing and reviewing the text.

References

Adu-Afarwuah S., Lartey A., Zeilani M. & Dewey K. (2010) Acceptability of lipid based nutrient supplements (LNS) among Ghanaian infants and pregnant or lactating women. *Maternal and Child Nutrition* **7** (4), 344–356.

Aubel, J. (2012) The role and influence of grandmothers on child nutrition: culturally designated advisors and caregivers. *Maternal and Child Nutrition* **8** (1), 19–35.

Cayemittes M., Placide M.F., Mariko S., Barrere B., Severe B. & Alexandre C. (2007) *Enquete mortalite, morbidite, et utilization des services, Haiti, 2005–2006*. Macro International [serial online]. Available at: http://www.measuredhs.com/pubs/pdf/FR192/FR192.pdf (accessed 15 January 2013).

Dempsey P. & Gesse T. (1983) The childbearing Haitian refugee: cultural applications to clinical nursing. *Public Health Reports* **98** (3), 261–267.

Dornemann J. & Kelly A. (2013) 'It is me who eats, to nourish him': a mixed-method study of breastfeeding in post-earthquake Haiti. *Maternal and Child Nutrition* **9**, 74–89.

Farmer P. (1988) Bad blood, spoiled milk: bodily fluids as moral barometers in rural Haiti. *American Ethnologist* **15** (1), 62–83.

Flax V., Thakwalakwa C., Phuka J., Ashorn U., Cheung Y., Maleta K. *et al*. (2009) Malawian mothers attitudes toward use of two supplementary foods for moderately malnourished children. *Appetite* **53**, 195–202.

Flax V., Phuka J., Cheung Y., Ashorn U., Maleta K. & Ashorn P. (2010) Feeding patterns and behaviors during home supplementation of underweight Malawian children with lipid-based nutrient supplements or corn-soy blend. *Appetite* **54**, 504–511.

Gatti, L. (2008) Maternal perceptions of insufficient milk supply in breastfeeding. *Journal of Nursing Scholarship* **40** (4), 355–363.

Garenne M. (2010) Urbanisation and child health in resource poor settings with special reference to under-five mortality in Africa. *Archives of Disease in Childhood* **95**, 464–468.

Haiti Child Health Institute (HCHI), Haitian Institute of Statistics and Informatics & Macro International, Inc. (2006) *Haiti Demographic and Health Survey 2005–2006*. Calverton, NY.

Iannotti L., Jean Louis Dulience S., Green J., Joseph S., Francois J., Antenor M. *et al*. (2014) Linear growth increased in young children in an urban slum in Haiti: a randomized controlled trial of a lipid-based nutrient supplement. *The American Journal of Clinical Nutrition* **99**, 208–198.

Kumar S. (2002) *Methods for Community Participation: A Complete Guide for Practitioners*. ITDG: Warwickshire.

Menon P., Ruel M., Loechl C. & Pelto G. (2003) *From Research to Program Design: Use of Formative Research in Haiti to Develop a Behavior Change Communication Program to Prevent Malnutrition*. FCND Discussion Paper No. 170. International Food Policy Research Institute: Washington, DC.

Menon P., Ruel M., Pelto G., François Y., Metellus E. & Ferrus A. (2005) *A qualitative study of the patterns of infant feeding and care in the Hinche area of Plateau Central, Haiti*. Draft Report submitted to The Food and Nutrition Technical Assistance (FANTA) Project.

Ministry of Public Health and Population (MSPP), UNICEF, World Food Program (WFP) (2012). *1st Ed. Report of a national nutrition survey with SMART methodology*.

Obermeyer C. & Castle S. (1997) 'Back to nature?' Historical and cross-cultural perspectives on barriers to optimal breastfeeding. *Medical Anthropology* **17**, 39–63.

Parker M., Bentley M., Chasela C., Adair L., Piwoz E., Jamieson D. *et al*. (2011) The acceptance and feasibility of replacement feeding at 6 months as an HIV prevention method in Lilongwe, Malawi: results from the BAN study. *AIDS Education and Prevention* **23**, 281–295.

Pelto G. & Armar-Klemesu M. (2011) Balancing nurturance, cost and time: complementary feeding in Accra, Ghan. *Maternal and Child Nutrition* **7** (Suppl. 3), 66–81.

Pelto G.H., Armar-Klemesu M., Siekmann J. & Schofield D. (2013) The Focused ethnographic study 'assessing the behavioral and local market environment for improving the diets of infants and young children 6 to 23 months old' and its use in three countries. *Maternal and Child Nutrition* **9** (Suppl. 1), 35–46.

Pelto G.H., Levitt E. & Thairu L. (2003) Improving feeding practices: current patterns, common constraints, and the design of interventions. *Food and Nutrition Bulletin* **24** (1), 45–82.

Roman S.B. (2007). *Exclusive Breastfeeding Practices in Rural Haitian Women*. UCHC Graduate School Masters Theses 2003–2010. Paper 141.

Sellen D. (2001) Weaning, complementary feeding and maternal decision making in a rural east African pastoral population. *Journal of Human Lactation* **17**, 233–244.

Wang R.J., Trehan I., LaGrone L., Weisz A., Thakwalakwa C., Maleta K. *et al*. (2013) Investigation of food acceptability and feeding practices for lipid based nutrient supplements and blended flours used to treat moderate malnutrition. *Journal of Nutrition Education and Behavior* **45** (3), 258–263.

Whitehead R.G., Rowland M.G.M., Hutton M., Prentice A.M., Müller E. & Paul A. (1978) Factors influencing lactation performance in rural Gambian mothers. *Lancet* **312** (8082), 178–181.