A qualitative evaluation of health service-based nutrition education provided to caregivers in the districts of Mórrope and Incahuasi, Lambayeque, Peru

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Abstract

Objective. The objective of the present study was to identify influential factors on effective transfer of knowledge about improved nutrition practices to caregivers, including interpersonal relationships between health professionals (HP) and caregivers.

Methods. Data were collected in six health establishments in two Lambayeque districts in northern Peru. We completed in-depth interviews with 5 HP, and 34 exit interviews with caregivers, of whom 7 gave in-depth interviews and 5 also permitted home observations. In addition, 29 direct participant observations of visits to the child growth and development monitoring program were conducted to observe the counselling.

Results. Barriers and limitations to health service-based nutrition education were identified. The category of personnel influenced the type of nutrition messages and amount of detail provided with nutritionists targeting dietary diversity, food consistency, and frequency of feedings, and nurses focusing on how to use multi-micronutrient powders and increase consumption of iron-rich foods (e.g., liver, *sangrecita*). Positive verbal communication (e.g., praise) and non-verbal language (e.g., smiles) of HP made caregivers feel more comfortable when attending the health services. Learning materials (e.g., model plates) and group demonstration sessions facilitated caregiver comprehension, whereas caregivers' Quechua language was a barrier. Challenges that affected the continuity of good counselling in the health services were the frequent rotation of health service personnel and access to the health services, especially nutrition services. Lack of collaboration between different types of HP prevented a greater coverage of nutrition services and contributed to an unpleasant working environment. Lastly, cultural beliefs prevented the adoption of some messages for a few of the caregivers (e.g., consuming animal blood (*sangrecita*) was considered comparable to consuming the animal's soul).

Discussion. Nutrition education efforts need to not only focus on knowledge acquisition and counselling skills, but also to promote HP's understanding of their patients' realities and environment. High personnel turnover hindered gains in expertise of the HP and inhibited continuity of the services. To improve nutrition education services within rural health facilities, the Ministry of Health should consider harmonizing formal nutrition training provided to HP. This would ensure all health staff entering the workforce would hold a basic knowledge of nutrition and optimal infant and young child feeding practices.

Résumé

Objectif. L'objectif de la présente étude fut d'identifier les facteurs influents le transfert efficace de meilleures pratiques nutritionnelle aux parents. D'un intérêt particulier fut d'examiner les relations interpersonnelles entre les professionnelles de la santé (PS) et les parents.

Méthodes. Les données furent collectées dans six établissements de santé dans deux des quatre districts choisis dans Lambayeque. Nous avons complété cinq entrevues approfondies avec les PS, et 34 entrevues de sortie avec des parents, desquels 7 ont participé dans des entrevues approfondies et dont 5 ont permis des observations de leur maison. De plus, 29 observations directes des visites au programme de suivi de croissance et de développement de l'enfant ont été complétées afin d'observer les consultations.

Résultats. Différents obstacles et facilitateurs au service d'éducation nutritionnelle furent identifiés. Le type de PS donnant l'éducation nutritionnelle influençait les messages nutritionnels et la quantité de détails fournis. Les nutritionnistes ciblaient la diversité alimentaire, la consistance des aliments, ainsi que la fréquence de l'alimentation, tandis que les infirmières visaient l'usage des poudres de micronutriments multiples et la consommation d'aliments riches en fer (ex., foie, *sangrecita*). L'usage de langage verbal (ex., donner des éloges) et non-verbal (ex., sourire) positif créait un atmosphère plus agréable et confortable pour les parents. Les matériels didactiques (ex., maquettes) et les démonstrations de groupes facilitaient la compréhension, tandis que la langue Quechua des parents en empêchait. Les obstacles qui affectaient la continuité des consultations dans les services de santé incluaient la rotation fréquente du personnel de santé et l'accès aux établissements, surtout au service de nutrition. Finalement, quelques croyances prévenaient l'adoption de certains messages nutritionnels (ex., la consommation du sang d'animal (*sangrecita*) est comparable à consommer l'âme de l'animal).

Discussion. Les efforts dévoués à l'éducation nutritionnelle doivent cibler non seulement l'acquisition de connaissances et de compétences de conseil, mais doivent aussi promurent la compréhension du PS envers la réalité et l'environnement dans lequel vivent leurs patients. Un taux élevé de rotation du personnel empêchait l'augmentation de compétences du personnel et limitait la continuité des services de santé. Afin d'améliorer les services d'éducation nutritionnelle fournis dans les établissements de la santé des régions rurales, le Ministère de la Santé devrait considérer l'harmonisation de la formation professionnelle en nutrition donnée aux

PS. Ceci garantirait que tout professionnel entrant le marché du travail détiendrait une connaissance de base de la nutrition et des pratiques optimales pour les nourrissons et les jeunes enfants.

Author's contributions

M. B. Charron is the primary author of the manuscript included in this thesis. M. B. Charron planned most of the study and was responsible for recruiting caregivers and health professionals and for obtaining consent for their participation. M. B. Charron collected all of the data with the help of a research assistant, and did all of the data analysis.

G. Marquis is M. B. Charron's supervisor. G. Marquis helped in the planning and coordinating of the study and in obtaining ethics approval.

R. Bartolini helped in the organization of the project in Peru by coordinating with local health officers to allow for data collection to occur. R Bartolini also provided expert advice on the data collection tools and processes.

H. Creed-Kanashiro helped in the organization of the project in Peru and provided input on the data collection tools and processes.

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Table of Contents

Abbreviations

ASF: Animal-source foods

BF: Breastfeeding

CF: Complementary feeding or complementary foods

CFR: Complementary feeding recommendations

CI: Confidence interval

CIMCI: Community Integrated Management of Childhood Illnesses

CRED: *Crecimiento y Desarrollo* (Growth monitoring and promotion)

DHS: Demographic and Health Survey

DID: Difference-in-differences

EBF: Exclusive breastfeeding

GERESA: *Gerencia Regional de Salud* (Regional government health department)

HAZ: Height-for-age z-scores

Hb: Hemoglobin

HBM: Health Belief Model

HIV: Human immunodeficiency virus

HP: Health professional(s)

HW: Health workers

IIN: *Instituto de Investigación Nutricional* (Nutrition Research Institute)

INE: Intensive nutrition education

INEI: *Instituto Nacional de Estadistica e Informatica* (National Institute of Statistics and Information Technology)

IYC: Infant and young children

IYCF: Infant and young child feeding

KAP: Knowledge, attitudes, and practices

LAZ: Length-for-age z-score

MAD: Minimal acceptable diet

MDD: Minimum dietary diversity

MeSH: Medical Subject Headings

MINSA: *Ministerio de Salud* (Ministry of Health)

MJ: Megajoule

MMF: Minimum meal frequency

MMN: multi-micronutrient powder (micronutrient supplement)

MUAC: Mid-upper arm circumference

NIP: Nutrition Improvement Program

NS: Not significant

OR: Odds ratio

RCT: Randomized controlled trial

RCF: Responsive complementary feeding

RF: Responsive feeding

SERUMS: *Servicio Rural y Urbano Marginal en Salud* (Rural and Peri-urban National Health Service)

SF: Supplementary foods/feeding

SGA: Small-for-gestational age

UNICEF: United Nations Children's Fund

USAID: U.S. Agency for International Development

WAM: Weight-for-age median

WAZ: Weight-for-age z-score

WHO: World Health Organization

WHZ: Weight-for-height z-score

List of tables

List of figures

1. Introduction

1.1. Undernutrition and its causes

Adequate nutrition is crucial to all aspects of life, and affects growth and development in infancy, prevalence of diseases in all life stages, and economic productivity in society (Black *et al.,* 2013). A combination of factors may cause an adequate diet to be inadequate. The following two sections will provide a brief overview of the evidence on the most proximal causes of undernutrition in children under five years, namely poor dietary intake and presence of morbidity (UNICEF, 2003). However, it is important to bear in mind that the list of causes is certainly more complex and extensive than what is presented here.

1.1.1. Dietary intake

The World Health Organization (WHO) recommends that breastfeeding (BF) be initiated within one hour of birth and that infants be exclusively breastfed for the first six months of life, after which BF should be accompanied by complementary foods until two years of age or beyond (WHO, 2003). When practices are not in line with recommendations and dietary intake is suboptimal, even prior to pregnancy, consequences may lead to growth faltering (e.g., low birth weight, underweight, stunting), increased risk of illness (e.g., pneumonia and diarrhea) and increased risk of mortality due to infectious diseases (Black *et al.,* 2013; Prado and Dewey, 2014; Caulfield *et al.,* 2004; Black *et al.,* 2008; Imdad *et al.,* 2011). Such outcomes were observed in non-exclusively breastfed infants living in Malawi who demonstrated lower weight-for-age z-scores (WAZ; -0.97; 95% Confidence Interval (CI): -1.18 to -0.76 vs -0.41, 95% CI: -0.66 to -0.17) and length-for-age z-scores (LAZ; -1.59, 95% CI: -1.80 to -1.38 vs -1.13, 95% CI: -1.37 to -0.88) than infants who were exclusively breastfed (all at least $p<0.01$; Kuchenbecker *et al.,* 2015). Caregivers of non-exclusively breastfed children also reported a higher number of episodes of fever ($\chi^2 = 11.26$) and diarrhea ($\chi^2 = 12.13$) in the two weeks prior to data collection (both p=0.001). Length of breastfeeding time is also important as was shown in infants in Belarus who when exclusively breastfed for 6 months were found to be about 40% less likely to develop gastrointestinal infections compared to infants exclusively breastfed for only 3 months (Odds Ratio (OR) 0.61, 95% CI: 0.41 to 0.93) (Kramer *et al.,* 2003). A prospective cohort study in the Netherlands identified reduced risk of infectious diseases in exclusively breastfed infants (for 4 to 6 months) and infants who received any breastfeeding for longer periods of time (6 months or more) (Duijts *et al.,* 2010). In fact, when exclusively breastfed until

the age of at least 4 months, children were less likely to have upper and lower respiratory tract infections (OR 0.65, 95% CI: 0.51 to 0.83, and OR 0.50, 95% CI: 0.32 to 0.79, respectively) as well as gastrointestinal tract infections (OR 0.41, 95% CI: 0.26 to 0.67) during their first 6 months of life. A protective effect against upper and lower respiratory tract infections continued to be present from 7 to 12 months of age for infants who were breastfed for 4 to 6 months (OR 0.56, 95% CI: 0.38 to 0.84, and OR 0.54, 95%CI: 0.37 to 0.79, respectively). Dietary intake continues to be important after the first 6 months of life. In Laos, not consuming fruits or vegetables on the previous day was associated with more than a 50% increase in risk of stunting (height-for-age z-scores (HAZ) <-2SD) in children under five years of age (OR: 1.54, 95% CI: 1.12 to 2.11, $p<0.01$) compared to children who had consumed some (Phengxay *et al.*, 2007). Limited meat ($p<0.01$) and vegetable ($p<0.05$) consumption during illness more than doubled the risk of children being underweight (Weight-for-age z-scores (WAZ) <-2SD) (respectively, OR: 2.31, 95% CI: 1.37 to 3.90 and OR: 3.00, 95% CI: 1.28 to 7.02, both at least $p<0.05$).

1.1.2. Morbidity

Malnutrition can also be caused by the presence of poor sanitation practices and infections. Poor water quality and sanitation practices are both associated with poor growth indicators; specifically, having no piped water in the household was associated with lower LAZ ($p<0.05$) and having a pit latrine or no latrines versus a flush-toilet was indicative of lower WAZ ($p=0.001$) in Brazilian children less than five years (Victoria *et al.,* 1986). In terms of illness, a cross-sectional study looking at the prevalence of underweight, stunting, and wasting in Kenyan children under five years determined that overall presence of illnesses (e.g., fever, diarrhea, upper respiratory tract infections, measles) within the previous 30 days increased children's risk of being underweight (OR: 3.11, 95% CI: 1.51 to 6.38) (Bloss *et al.*, 2004).

Causes of child undernutrition are varied and include, amongst others, poor dietary intake, presence of infections, and environmental causes such as poor water and sanitation. Cognition, behavioral conduct, school performance, and work performance in adulthood may also be affected by nutritional deficiencies (Prado and Dewey, 2014). These types of consequences have implications for the economic productivity of both the individual and society as a whole (Prado and Dewey, 2014; Dewey and Begum, 2011). Stunted infants may grow to have diminished intellectual, educational, and economic capacities as adults, and have higher chances of giving birth to term and preterm small-for-gestational age or low birthweight infants, transferring the

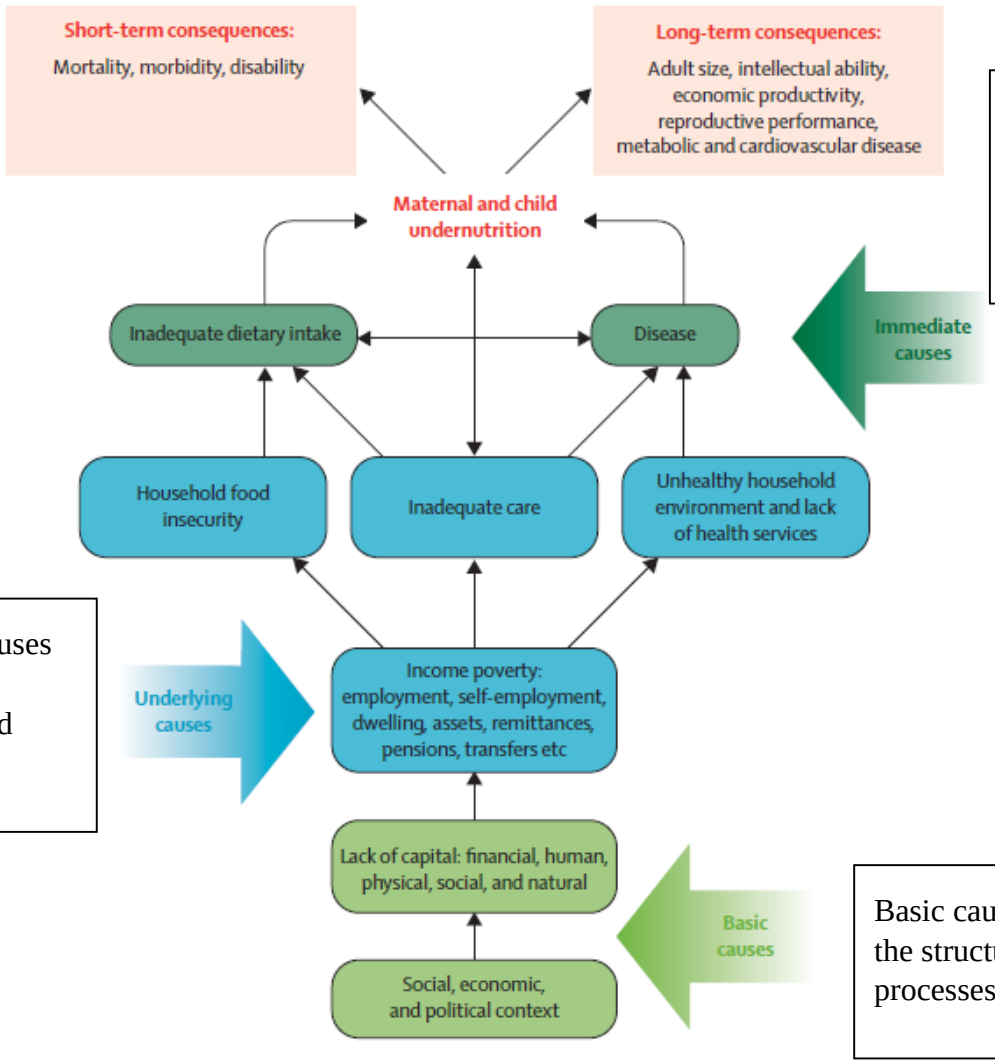
consequences of undernutrition to the next generation (Black *et al.*, 2013, Dewey and Begum, 2011, Grantham-McGregor *et al.*, 2007).

1.2. UNICEF's conceptual framework on child malnutrition

In 1990, as part of their strategy to improve nutrition in children and women in developing countries, UNICEF developed a conceptual framework to better understand the role of different stakeholders and how these interactions can be harnessed to reduce undernutrition (UNICEF, 1990). It identified three levels of causes which may be present at the different levels of society, household/community, district, and national levels. The three levels of causes include immediate, underlying, and basic causes. *Immediate causes* include insufficient dietary intake and disease leading to improper absorption of nutrients or increased requirements (as discussed in the previous section). Where immediate causes can be quickly assessed, further investigation is needed to identify *underlying causes*, which explain the presence of insufficient intake and disease. These may be the consequences of poor familial economic resources, improper access to water, inadequate access to healthcare, or inadequate education. Lastly, *basic causes* have to do with the social, political, and economic context of the society in question. Basic causes may be due to internal factors such as ecological constraints of the region or country (harsh temperatures or topography), power relationships within the society, political structure and function (tax, subsidies, pricing structure of markets), or external factors such as dependency on foreign economies (see figure 1.1 for a diagram of the framework). This conceptual framework was developed to improve sustainability of interventions and ensure longstanding results. It also allows the identification of key players in the link between underlying and basic causes.

This conceptual framework is in line with the epistemological position of the investigator in that the aim of this project was to understand caregivers' behaviors in relation to infant and young child feeding (IYCF) practices, and examine health professional knowledge delivery, to determine how these affect knowledge and actions. This research is framed within a constructivistic paradigm where it is believed that each individual's reality affects his or her perceptions and understanding (Green and Thorogood, 2014).

Figure 1.1 UNICEF conceptual framework on child malnutrition



Immediate causes operating at the individual level

Underlying causes influencing households and communities

Basic causes around the structure and processes of societies

Source: Black et al., 2008

2. Literature Review

2.1. Methods

The Cochrane Library, Medline (Ovid), and PubMed databases were searched for literature on interventions of complementary feeding nutrition education. Titles were first read to determine the relevance of the article to the topic in question and to remove those not pertinent to this research project. Abstracts of the remaining articles were then read to assess whether the research objectives of the studies were in line with those of this particular project. Additional citations were obtained through the review of these studies' bibliographies.

The different *MeSH* words and expressions used included a combination of the following different terms: *nutrition education, nutrition education intervention, nutrition counsel*, nutrition behavio* intervention, community nutrition, breastfed*, complementary feeding, infant feeding, health professional, health worker, health personnel*. These terms were combined using *and,* and *or* to allow the search to be more specific.

Results of studies were summarized and presented with their corresponding p-values in the text. Detailed information about the studies, including the effect size of the interventions, can be found in corresponding summary tables 2.1 and 2.2 at the end of literature review.

2.2. Nutrition interventions

Due to the diverse causes of malnutrition, programmes have worked to reduce the prevalence of undernutrition through the use of different types of interventions, including those that are nutrition sensitive and those that are nutrition specific (Ruel *et al.,* 2013). Whereas nutrition-specific interventions target the immediate causes of poor nutrition (inadequate dietary intake or disease), nutrition-sensitive approaches work in improving underlying causes (e.g., food insecurity, poor maternal knowledge of IYCF practices, poor water and sanitation). Nutrition-specific interventions include fortification (e.g., salt iodization), supplementation (e.g., iron supplementation, *Sprinkles*), health-related actions (e.g., deworming), and regulatory interventions (e.g., regulation of marketing of breast-milk substitutes). Nutrition-sensitive approaches include behavioral interventions on breastfeeding, proper water and sanitation, and agricultural practices, amongst others (WHO, 2016; Ruel *et al.,* 2013). Behavioral interventions seek to improve an individual's practices and habits (WHO, 2016). Such approaches include education interventions which may involve the training of community workers, volunteers, or

healthcare professionals in the effective delivery of educational messages (Dewey and Adu-Afarwuah, 2008). Education may also be provided through peer counselling or formal education by health professionals (in school or health establishments) (WHO, 2016). Behavioral interventions, which will be the focus of this review, have been successful in improving nutrition-related outcomes such as caregiver and health professional knowledge, child nutrient intake, dietary diversity, and height and weight.

2.2.1. Nutrition education interventions targeting caregivers

As mentioned previously, exclusive BF (EBF) is considered the best practice from the time a child is born until their sixth month of age, at which point solid foods should be introduced in the infant's diet while continuing BF until two years of age or later (WHO, 2003). Nutrition researchers targeting behavior change frequently direct their efforts at maternal or caregiver knowledge and practices. Focus is consequently often put on optimal BF and complementary feeding (CF) practices and typical key messages encourage (i) continued BF along with complementary foods after 6 months of age, (ii) the consumption of thick porridges instead of water-based soups, (iii) the use of animal-source foods (ASF), and (iv) dietary diversity, amongst other messages (Black *et al.,* 2013, Dewey and Adu-Afarwuah, 2008). These interventions generally take place from the time of a woman's pregnancy through the first two years of life of the infant. This time period, called the first 1,000 days of life, is considered the window of opportunity for the benefits of proper nutrition and healthy growth to be longstanding (Black *et al.,* 2013). The following trials demonstrate that interventions have been successful in improving caregiver knowledge, feeding and care practices, and infant growth parameters.

Caregiver knowledge, feeding, and care practices

Maternal knowledge and practices of child feeding and health can be improved through different approaches. A participatory intervention in rural Bangladesh employing monthly women's group discussions on topics such as child health problems, nutrition, diarrhea, and immunizations helped increase caregiver knowledge of IYCF practices and health of children under 5 years (Younes *et al.,* 2014). Specifically, at least 10% more mothers had adequate knowledge on exclusive BF (EBF) and handwashing when preparing food and feeding a child ($p<0.001$). Exclusive BF was maintained for almost 40 days longer than in mothers who did not participate in monthly discussions ($p<0.001$). Education may also help in delaying the introduction of solid

foods in the infant's diet. Adolescent Brazilian mothers who were educated on optimal BF and CF practices introduced non-breast milk and complementary foods at a median of 153 days (95% CI: 114.6 to 191.4) compared to 95 days (95% CI: 78.7 to 111.3) among mothers who had not received education (Oliveira *et al.*, 2012). Additionally, at least 10% less intervention infants had consumed non-breast milk, fruits, and salty foods at the age of 4 months compared to control infants. In other words, 41% of control infants (95% CI: 32.8 to 49.2%) were given complementary foods at 4 months compared to 22.8% of intervention infants (95% CI: 15.9 to 29.7%).

Knowledge may also help promote behavior modification by helping caregivers understand concepts such as their children's susceptibility to malnutrition and the severity of such a condition (Tariku *et al.,* 2015). After receiving a nutrition education intervention that was built upon concepts of the Health Belief Model (HBM), Ethiopian mothers had a better understanding of the susceptibility (4.03 vs 2.78, $p<0.001$) and severity of malnutrition (3.54 vs 2.93, $p<0.05$), and the benefits of good CF practices (2.30 vs 2.03, $p<0.05$) at endline compared to baseline. They observed a 20% increase in self-efficacy in putting in practice messages provided to them ($p<0.001$) and a 15 % decrease in perceived barriers to carrying out good CF ($p<0.002$). While there was no real effect of the intervention on practices of hygiene and meal frequency, mean child dietary diversity scores increased by approximately 20% from baseline in mothers receiving nutrition education based on the HBM ($p<0.05$). Mulualem and colleagues (2016) also developed CF messages based on HBM constructs to increase dietary diversity of Ethiopian children 6-18 months. The use of pulses was emphasized to improve the protein quality of meals consumed by children. After 6 months of nutrition education with recipe-based food demonstrations, there was no significant differences in the use of pulses as opposed to cereals between control and intervention mothers. However, scores were computed based on the number of correct practices performed by the mother and overall scores were six times higher in intervention mothers compared to both baseline data and control mothers at endline (6-months post-intervention) ($p=0.001$).

Nutrition interventions have demonstrated that there is potential to not only increase caregiver knowledge but to have effects on infants and their dietary intake. Fahmida and colleagues (2015) provided caregivers of an Indonesian district with nutrition education focused on key problem nutrients (e.g., calcium, iron, and zinc) and delivered key CF recommendations such as adding

shredded chicken liver, fish, or dried anchovies to each main meal. Maternal knowledge in regard to the importance of these nutrients almost doubled for iron, zinc, and calcium ($p<0.001$). Intakes were consequently higher in intervention children than in control children for different nutrients including calcium (139 vs 100 mg), iron (3.3 vs 2.4 mg), and zinc (2.9 vs 2.2 mg) (all $p<0.001$). Indian children were also found to have a better dietary intake after their mothers were given intensive nutrition education (three times over six weeks) on optimal CF practices followed by weekly monitoring sessions to verify practices and reiterate nutrition messages (Palwala *et al.*, 2009). Consumption of green leafy vegetables and carrots was five times higher ($p<0.001$), less than 10% of infants drank tea or coffee at weeks 13 or 14 compared to 50% at baseline ($p<0.05$), and infants ate more eggs (29 ± 23 g vs 20 ± 20 g, $p<0.05$). In a similar Chinese intervention, Shi and colleagues (2009) showed that with maternal education and cooking demonstrations, intervention children consumed a greater number of meals per day at 12 months of age (4.19 vs 2.90, $p<0.001$) and almost 40% more ate more meats (both $p<0.001$) compared to control children. Caregivers who had received nutrition counselling were also more than three times more likely to encourage their child to eat when they turned down food ($p<0.001$). An additional positive outcome from this study was the improvement in good sanitation practices in the intervention group; more mothers washed their hands with soap and clean water compared to their counterparts (62.5% vs 44.9%, $p<0.001$). Even without cooking demonstrations, nutrition counselling alone is effective in changing caregiver practices. In rural India, monthly nutrition counselling by health workers resulted in infants being fed foods from at least 5 different food groups ($p=0.01$) at least 4 times a day ($p<0.001$) (Kilaru *et al.*, 2005).

Such beneficial results of nutrition interventions were also noted in African settings. Ogundele and Ogundele (2015) compared two Nigerian districts one of which had been participating in the Community Integrated Management of Childhood Illnesses (CIMCI) program and had community workers educating mothers on prolonged BF, CF, and feeding and care of infants with diseases. Infants living in CIMCI-implementing communities had better feeding practices with 89.7% of infants being fed more than 8 times a day compared to 67.9% in non-implementing communities ($p<0.05$). Waswa and colleagues (2015) found that more infants of caregivers in rural Kenya who received trainings on nutrition and cooking demonstrations

achieved a minimum dietary diversity score (MDD[1]) (87.3% vs 55.7%, p<0.001), a minimum meal frequency (MMF[2]) (98.8% vs 88.6%, p<0.05), and a minimum acceptable diet (MAD[3]) (87.8% vs 51.9%, p<0.001) compared to infants whose caregivers had not received nutrition education. Despite these positive results, an important increase in the rate of stunting was noted in the intervention group; where 29.3% of the infants were stunted at baseline, this increased to 49.1% at endline, which was more than the rate of 34.0% registered in control infants (p=0.04). In a rural Malawi community-nutrition education intervention, children whose caregivers had received nutritional counselling over a period of five months observed an approximate 10% increase in both their MMD and MAD (both at least, p=0.02) (Kuchenbecker *et al.,* 2017). In Malawi, mothers were provided nutrition education lessons on (1) how to increase the energy density of a common porridge, (2) methods to improve the intake of bioavailable iron and zinc, (3) how to augment the nutrient and energy density of porridges, and (4) how to encourage their children to eat (Hotz and Gibson, 2005). Improvements in the nutrient density of CF prepared by intervention mothers were minimal with only energy density (352 vs 305kJ/100g, p<0.001), and iron (2.2 vs 1.9mg/MJ[4]) and riboflavin (0.11 vs 0.09mg/MJ) density having increased (both p<0.05). However, the overall higher amount of food consumed (610g vs 589g, p<0.05) by intervention children led increased intakes of protein and fat (p<0.001), calcium (p<0.05) and other micronutrients (iron, zinc, niacin and riboflavin, all at least p<0.01).

Engaging in appropriate feeding and care practices also requires caregivers to practice responsive feeding whereby a parent engages in communication with their child by paying attention to them, perceiving cues coming from their child, and responding to them through actions such as smiles, words of encouragement, and patience during feeding time (Aboud *et al.,* 2008; Black and Aboud, 2011). Some studies incorporated this concept within the messages given to mothers, encouraging them to "teach [their] child to eat with love, patience, and good humour" and tailoring the nutrition education to promote responsive CF (Penny *et al.,* 2005; Vazir *et al.,* 2013). With the intention to enhance the mother-child relationship and improve child dietary

[1] MDD: 4 or more food groups per day

[2] MMF: 2 times per day for BF 6-8mo infants, 3 times per day for BR 9-23mo children, and 4 or more times per day for non-BF children

[3] MAD: composite indicator calculated from MDD and MMF

[4] MJ: Megajoule

intake, Vazir and colleagues (2013) provided regular CF education (focusing on feeding messages) and responsive CF education (providing CF messages, messages on how to respond to the child's cues and messages on psychosocial stimulation) to mothers in rural Indian villages. While CF knowledge increased by about 10 to 30% in mothers ($p<0.05$) in both the regular and responsive CF education groups at 15 months, responsive feeding knowledge was not significantly different in mothers who had received responsive CF education except in regard to the recommendation that food be fed more often during illness ($p<0.05$). These gains in CF knowledge led to at least 20% more intervention children being fed liver and poultry, however these were only given once or twice a week ($p<0.05$). Eggs were consumed by more than 70% of intervention children, but again at a low frequency of once or twice a week ($p<0.05$). A trial in Bangladesh targeted maternal RF knowledge with the goal to increase children's practice of self-feeding, the quantity of food consumed, and weight gain (Aboud *et al.*, 2008). Despite a 15% increase in children's self-feeding ($p=0.03$) at the 5-month follow-up, this behavior did not translate into more food being eaten (in terms of mouthfuls). Nonetheless, there was approximately one third of a kilogram more gained in intervention children ($p=0.002$) which was thought to be due to higher quality foods being self-fed. Lastly, while the number of acts of responsiveness observed during meal time was not significantly higher in intervention participants, about six times more mothers recalled RF messages of hygiene and RF, and ten times more mothers remembered the recommendation of talking to their child while feeding (all $p<0.0001$).

Nutrition education interventions may make use of a number of avenues for caregiver education. In India, local health workers were trained in nutritional assessment and communication skills and were instructed to make use of different delivery channels such as immunization and weighing sessions, home visits, and sick child visits to provide nutrition education (Bhandari *et al.*, 2004; Bhandari *et al.*, 2005). At three months of age, rates of EBF improved with an increased number of counselling source (70.8% for those counselled from 0 sources, 81.3% when counselled through 1 or 2 channels, and 93.6% when counselled through 3 or more sources, $p=0.002$) (Bhandari *et al.*, 2005). At 18 months, intervention children consumed almost 1,000 more kilojoules than control children ($p=0.001$) (Bhandari *et al.*, 2004). Lastly, intervention caregivers were almost five times more likely to take part in responsive feeding and encourage their infants to eat more ($p<0.0001$).

Child growth parameters and health status

Nutrition interventions often concentrate on maternal knowledge with the ultimate goal to improve child growth parameters and health status. In peri-urban Pakistan, the provision of education on the importance of BF, CF, and proper hygiene and sanitation during home visits improved mean weight of infants by 350 g and mean height by 0.66 cm compared to control infants only given BF recommendations according to national guidelines (details not provided) ($p=0.001$) (Saleem *et al.*, 2014). A similar Bangladeshi home education intervention found that the proportion of children who became malnourished (WAZ <-3SD) almost quadrupled from baseline to endline when mothers did not receive CF messages (control) ($p<0.001$) compared to treatment children where the increase was not significant ($p>0.05$) (Brown *et al.*, 1992).

In China, Zhang and colleagues (2013) conducted a follow-up study and assessed children 3 months after the end of a nutrition education intervention (by Shi *et al.*, 2009) to determine whether there were growth changes. In the first study by Shi and colleagues (2009), children were followed for a year from 3 months of age until 15 months and no significant differences in growth were noted between intervention and control infants. At 18 months, however, WAZ (0.18 ± 0.90 vs -0.09 ± 0.93, $p=0.001$) and weight-for-height z-scores (WHZ) (0.49 ± 1.07 vs 0.19 ± 0.97, $p=0.002$) were significantly higher in intervention children than control children (Zhang *et al.*, 2013). Intervention children were also 30% less likely to be stunted than their counterpart (OR 0.71, 95% CI: 0.53 to 0.94). This study illustrates that while changes in maternal knowledge and dietary intake can be more rapid, variation in growth takes longer to occur. In a similar study in rural China, local nutrition educators were trained to conduct monthly home visits during which they handed each family a feeding guidebook and a growth chart, gave BF and CF recommendations, and answered caregiver questions (Guldan *et al.*, 2000). Over the year of monthly growth monitoring and counselling visits, overall BF prevalence ($p<0.05$) and rates of EBF ($p<0.02$) were almost 10% higher in intervention mothers. Complementary feeding knowledge was better in the intervention group with almost triple the caregivers identifying the correct first solid food to introduce in their infant's diet (egg yolk[5]) ($p<0.001$) and the correct age of introduction (4 months[6]). Lastly, growth improved with intervention infants demonstrating

[5] Chinese recommendation at the time of the study.

[6] Different from WHO recommendations which indicate that introduction of solid foods should occur at 6 months.

better weight-for-age (WAZ) and height-for-age (HAZ) z-scores compared to control infants (WAZ -1.17 vs -1.93, p=0.004; HAZ -1.32 vs -1.96, p=0.02).

Nutrition interventions with only education can be just as effective as when supplemental food is provided. Roy and colleagues' (2005) work in rural Bangladesh assessed whether intensive nutrition education (INE) given twice a week for three months would be effective in improving nutritional status of children 6-24 months compared to (i) regular nutrition education (C) provided every two weeks, and (ii) a combination of intensive education and supplementary feeding (INE+SF). Mothers were taught about food security, caring practices, sanitation, and disease control. After six months of observation, children's nutritional status was significantly better when caregivers received intensive education or intensive education and supplementary feeding (WAZ: -2.15 in INE+SF vs -2.41 in INE vs -2.84 in control, p<0.001). In another intervention based in Bangladesh, caregivers participated in interactive group sessions on common nutrition and health problems with counselors providing potential solutions and infants of these caregivers demonstrated improved growth parameters (Roy *et al.,* 2007). At 6-month post-intervention, intervention infants recorded better growth parameters, including WAZ (-1.90 vs -2.15, p<0.001) and LAZ (-1.90 vs -2.15, p<0.002) compared to control infants whose mothers had received regular nutrition services. Cooking demonstrations were also used to stress the importance of quality complimentary foods and counselors encouraged caretakers in engaging in responsive feeding. At the end of the observation period (6-month post-intervention), more intervention children were considered to still be better nourished than control children (88.9% vs 61.5%, p=0.01).

The various trials described above demonstrate that efforts put in implementing community nutrition education interventions have yielded positive results in different developing setting in the world. Mothers' IYCF knowledge increased and their practices improved. These led to improvements in children nutritional intake, with greater consumption of foods such as ASF, vegetables and fruits. Lastly, these better nutritional intakes led to children displaying improved growth parameters, such as increased weight and height z-scores.

2.2.2. Interventions targeting health services

Focus is not only placed on caregiver education but also on health workers and health professionals' knowledge and practice. The following studies describe interventions disseminated within health services and that targeted health professional nutrition knowledge and communication skills. Appropriate nutrition knowledge and effective delivery and counselling skills may improve maternal recall of recommendations (Santos *et al.,* 2001; Zaman *et al.,* 2008). In Nigeria, after receiving training on optimal infant and young child feeding (IYCF) practices and communication skills, more than half of health workers had knowledge on BF difficulties, an increased 10% of the health workers correctly answered questions on food consistency, and half of health workers were able to indicate the number of food groups to be included in a child's diet compared to one fifth of the workers at pre-intervention (Samuel *et al.,* 2016). The percentage of those who believed CF could be introduced at any time also decreased by more than 15% ($p<0.05$). A similar Brazilian study where health professionals (HP) received a 40-hour-training on IYCF practices and counselling skills found that overall knowledge almost tripled in intervention HP compared to control HP ($p<0.001$) (Bassichetto and Rea, 2008). In another Brazilian intervention where HP were given a one-hour training to refresh their IYCF knowledge along with counselling materials (IYCF counselling pocket guide, educational material for caregivers), infants whose caregivers were counselled by trained HP were at least 20% more likely to be exclusively breastfed until 3 months of age ($p<0.05$) compared to their counterpart (Vitolo *et al.,* 2014). These infants were also 62% more likely to consume meats four or more times per week than control infants ($p<0.05$).

As shown above, most nutrition interventions are disseminated throughout communities with the help of health workers, peer-counselors, or volunteers and are often conducted outside of health centers. There are, however, interventions which have targeted health services. In a research project in the health centers of Trujillo, Peru, it was noted that children who attended health facilities where health professionals had been trained in nutrition and counselling skills were three times less likely to be stunted compared to children attending control facilities ($p=0.02$) (Penny *et al.,* 2005). Another trial made use of health centers in Pelotas, Brazil to train doctors in nutritional assessment and counselling (Santos *et al.,* 2001). Following a 20-hr training course, trained doctors obtained an average score 15% point higher than that of control doctors ($p=0.02$). Counselling skills also improved with 10% more doctors applying good communications skills

(asking and listening to mothers) ($p<0.01$). At least two times more trained doctors gave appropriate recommendations (e.g., give chicken liver, give beans, and add butter or oil) to caregivers than control doctors ($p<0.001$). Lastly, more than 10% more trained doctors praised caregivers who reported an appropriate practice than untrained ones ($p=0.01$). These results were further confirmed after consultations were observed and it was noted that 30% more intervention physicians delivered at least one nutritional message during a consult ($p<0.02$) and almost 40% more praised mothers and verified that they had understood the information given to them ($p<0.01$) (Pelto *et al.*, 2004). Caregivers in the intervention group also expressed greater satisfaction of the services received than control mothers ($p=0.007$) and dietary intake of ASF such as chicken, beef, or egg yolk was at least two times higher in intervention infants than in control infants (all at least $p<0.01$) (Santos *et al.*, 2001). Similar results were obtained in a health center-based trial in Pakistan where almost 30% more health workers trained in nutrition counselling provided nutrition recommendations ($p<0.003$) compared to untrained ones (Zaman *et al.*, 2008). Mothers were praised four times more when reporting an appropriate practice than mothers attending facilities with untrained workers and almost 30% more HP explained why a particular change in feeding behavior was needed (both $p<0.01$). In addition to giving feeding recommendations and explaining why these were required, trained health workers attempted to make sure mothers understood explanations given to them (29% vs 2%, $p<0.01$). These improved communication skills encouraged at least 20% more caregivers to give foods like eggs ($p<0.05$) and meat ($p=0.05$).

The potential in using health services for nutrition interventions is further demonstrated in an evaluation of the Nutrition Improvement Program (NIP) in Cameroon (Reinsma *et al.*, 2016). This program involved a 3-month intense training course for certified food and nutrition health workers only, followed by a 3-month internship in a hospital. Health workers received education on various topics including IYCF practices and growth monitoring. The researchers reported that infants who attended hospitals and health centers with NIP-certified personnel were more likely to be exclusively breastfed compared to infants attending non-NIP facilities (OR 6.9, 95% CI: 2.30 to 21.09). Infants 6-8 months were also less likely to be stunted if they were frequenting NIP health facilities as opposed to non-NIP facilities (OR 5.5, 95% CI: 3.37 to 9.02).

In a similar fashion to community interventions, the different studies just described demonstrated that health service-based nutrition education interventions have been able to increase HP's IYCF

knowledge. This in turn lead to caregivers displaying better feeding and care practices with their children and children exhibiting better growth parameters.

2.2.3. Challenges and opportunities for nutrition education

While nutrition education initiatives have proven to be successful, barriers do exist and at different levels. At the community or caregiver level, caregivers' lack of nutrition knowledge, work burden within the household or community, and cultural influences affect the success of nutrition education interventions in improving the targeted outcomes (e.g., increased dietary diversity, reduced stunting or wasting) (Nankumbi *et al.,* 2015). Environmental factors such as a low access or availability of food can also affect the outcomes of a nutrition education intervention (Santos *et al.,* 2001). Food security is in fact considered essential for interventions to better caregiver practices (Vazir *et al.,* 2013). At the institutional level, critical factors that play a role in the success of an intervention include high personnel turnover, time restrictions for individual counselling, high patient load, staff's limited familiarity with key messages, and insufficient economic resources of health facilities (Robert *et al.,* 2007).

In interventions in general, whether they be community-based or health service-based, factors such as the intricacy of a specific behavior change, the presence of external limitations like low food access, and intensity of an intervention can all be limiting factors of a nutrition intervention (Santos *et al.,* 2001). These may all play a role in the relationships between healthcare professionals and caregivers and possibly hinder reception and comprehension of nutrition information by caregivers (Sunguya *et al.,* 2013).

As stated by Pelto and colleagues (2004), contact between infants and public sector services is probably highest when infants' caregivers seek help from health services, most often for curative purposes. This, combined with the general trustworthiness granted to health professionals, provides health workers with opportunities to intervene and promote healthy nutritional habits, and allows for easier implementation and eventual scale-up of interventions through the use of routine health and nutrition services (Guldan *et al.,* 2000; Bhandari *et al.,* 2005; Pelto *et al.,* 2004; Shi *et al.,* 2009; Zhang *et al.,* 2013; Vitolo *et al.,* 2014). Nutrition interventions disseminated within the community or through health services have both shown to be successful. It is, however, thought that a best approach would be to combine the actions of both so as to optimize results (Vitolo *et al.,* 2014; Reinsma *et al.,* 2016). Interventions targeting health

professionals are not only beneficial because they increase knowledge, but also because they often incorporate training on delivery of messages and better communication skills.

2.3. Tables

Table 2.1. Summary table of nutrition education interventions targeting caregivers

Authors and region	Participants (I: intervention, C: control)	Design	Intervention	Methods of measuring outcome	Results (intervention vs control/non-intervention)
Aboud et al., 2008 *Rural Bangladesh*	I: 102 mothers C: 100 mothers	Cluster RCT	I: 5 Weekly sessions in the month of May on responsive feeding followed by 1 refresher session in October (on top of regular sessions) C: regular health and CF nutrition sessions	Measurements made at recruitment, 2 weeks after end of sessions, and at 5-month follow-up • Attained and gained weight • # of mouthfuls eaten • Self-fed mouthfuls • Mother's responsive actions • Additional feeding practices	• Weight attained (10.34kg vs 9.88kg) and weight gained (1.38kg vs 1.04kg) improved in intervention children 5mo post-test (p=0.002) • % of mouthfuls self-fed was higher in intervention children (49.31 vs 32.89, p=0.03) • More mothers remembered RF messages of hygiene (34 vs 5), RF (31 vs 5), and to talk to the child (10 vs 1), all p<0.0001
Bhandari et al., 2004 ***Bhandari et al., 2005*** *Rural India*	8 communities I: 552 infants C: 473 infants	Cluster RCT	Trained health and nutrition workers counselled mothers on EBF, good CF practices, and hand washing to counsel mothers at different occasions (home visits, immunization clinics, and weighing sessions, sick child visits). Women's groups and feeding demonstrations reinforced optimal CF practices	Home visits every 3 months from 3 months to 18 months' old to determine: • Exposure to channels • Details of counselling received • Diseases experienced by child • Weights and lengths • 24-hr dietary recalls	• ↑ EBF at 3 months with increased number of counselling sources: 70.8% to 93.6%, p=0.002 • ↑ energy intake at 18mo: 3807±1527kJ/24hr vs 2577±1058kJ/24hr, p=0.001 • ↑ caregivers encouraged children to eat: 34.8% vs 7.7%, p<0.0001 • NS growth changes in girls • ↑ male length at 12 months: 0.51cm, 95% CI: 0.03 to 0.98, p=0.039 Most frequent counsel source: Birth-3mo: immunization sessions (45.1%) 6-9mo: home visits (42.6%) 9-12mo: home visits (~42%)
Brown et al., 1992 *Rural Bangladesh*	I: 62 children C: 55 children 4 to 14 months old at baseline	RCT	Field workers provided home demonstrations of recipes and counselling on continued BF, increasing nutrient-density of meals (protein, energy, and other nutrients), and optimal hygiene practices	Monthly data collection: • Anthropometric data (weight and arm circumference) • 24hr dietary recalls • Child morbidity data based on maternal recall of episodes of illnesses	Baseline vs Endline • ↑ proportion of malnourished control children, WAZ <-3: 9% to 35%, p<0.001 • ↑ ~460g in intervention children, p<0.001

Fahmida et al., 2015 *Rural Indonesia*	I (CFR): 239 mother-infant pairs C (non-CFR): 216 mother-infant pairs	Effectiveness study	3 intervention groups: 1) CF recommendations group (CFR): recipe-based CF recommendations targeting key problem nutrients (calcium, iron, zinc) given through monthly sessions 2) psychosocial stimulation 3) CFR + stimulation 4) Control	• Interview to assess caregiver IYCF knowledge and practices • One 24hr recall and one food frequency questionnaire	CFR vs non-CFR groups • ↑ mothers correctly answered question on importance of - Iron: 55.8 vs 23.3% - Zinc: 22.5 vs 2.8% - Calcium: 46.2 vs 26.5%, all p<0.001 • ↑ median nutrient intakes different nutrients including iron (3.3 vs 2.4mg), zinc (2.9 vs 2.2mg), and calcium (139 vs 100mg), all p<0.001
Guldan et al., 2000 *Rural China*	4 townships (~12 villages/townships) I: 250 infants C: 245 infants	Community-based pilot intervention	Local village nutrition educators received 3 training sessions (1/2 to 1 day) on nutrition and conducted monthly home visits on IYCF practices and weighed infants for 1y	• Infant's diet: food frequency listing + 24hr recall • Caregivers answered questions to determine their IYCF knowledge • HAZ, WAZ, and WHZ • Hb levels of infants	• Overall BF rate: 83% vs 75%, p=0.034 • EBF (for 4, 5, or 6 months): 58% vs 47%, p=0.017 • 65% vs 21% correctly identified egg yolk as first solid food, p<0.001 • WAZ: -1.17 vs -1.93, p=0.004 • HAZ: -1.32 vs -1.96, p=0.022 • WHZ: NS • Anemia: 22% vs 32%, p=0.008
Hotz and Gibson, 2005 *Rural Malawi*	I: 69 mother-child pairs C: 40 mother-child pairs Children aged 6 to 23 months	Controlled, before/after pilot intervention	4 education lessons provided over the course of 8 weeks 1) How to increase energy density of porridges 2) Methods to improve iron and zinc uptake 3) How to increase energy and nutrient density of a common porridge 4) How to encourage children to eat Home visits conducted 8 weeks after the last lesson to provide individual counselling to some caregivers	• Questionnaire on caregiver knowledge and IYCF practices • One 24hr recall	For children 12-23 months: • ↑ median amount consumed: 610g vs 589g, p<0.05 • ↑ intake of fat (8.9 vs 4.2g), animal protein (3.2 vs 0.0g), protein (16.0 vs 11.1g), niacin (4.0 vs 2.7mg), riboflavin (0.24 vs 0.17mg), calcium (111 vs 75mg), iron (4.8 vs 3.0mg), and zinc (2.6 vs 2.0), all at least p<0.05 • ↑ energy density of foods (kJ/100g): 352 vs 305, p<0.001 • ↑ riboflavin density (mg/MJ): 0.11 vs 0.09, p<0.05 • ↑ iron density (mg/MJ): 2.2 vs 1.9, p<0.05
Kilaru et al., 2005 *Rural India*	I: 173 infants Non-intervention: 69 infants From 13 villages	Intervention study	Intervention: Monthly nutrition education given to caregivers to see if feeding practices would change Non-intervention: normal standard of care	Monthly visits from enrollment (~5months) to over 24 months where research staff administered questionnaire and then discussed issues on: • Feeding practices • Weight, height (measured every 3 months) • Morbidity	• 78% vs 51% infants fed at least 4 times in one day in addition to being BF (p<0.001, OR=4.35, 95%CI: 1.96 to 10.00) • 42% vs 19% infants consumed food from at least 5 different food groups at age 11 months (p=0.01, OR=3.23, 95% CI: 1.28 to 7.69)

Kuchenbecker et al., 2017 *Rural Malawi*	Round 1 I: 419 mother-child pairs C: 413 mother-child pairs Round 2 I: 493 pairs C: 466 pairs Children aged 6-23 months	Cluster RCT	2 rounds of 10 community nutrition education sessions on IYCF practices, appropriate foods, nutrients, diets, and food preparation. Sessions delivered weekly or every 2 weeks over a period of 5 months. The second round of nutrition education delivered about 3 months after the end of round 1	• Questionnaire on caregiver IYCF knowledge and practices, time allocation, access to health facilities, water and sanitation • 24hr dietary recalls • Food security questionnaire • Weights and lengths of children	• ↑ MDD: DID 12.70%, p=0.01 • ↑ MAD: DID 11.86%, p=0.02 • HAZ NS
Mulualem et al., 2016 *Rural Ethiopia*	I: 80 mother-child pairs C: 80 mother-child pairs Children aged 6-18 months	Controlled before/after intervention	Bi-weekly, 6-month nutrition education targeting the use of pulses to improve protein intake. Counselling was based on health belief model constructs: perceived susceptibility and severity of malnutrition, benefits of and barriers to optimal IYCF practices and to the use of pulses, and cues to action in using pulses	• Interviews with caregivers with questions on caregiver KAP on pulse use and CF practices • Weight, length, and MUAC Data collected before, 3 months after the end of the nutrition education (midline), and 6 months post-intervention (endline)	• NS difference in IYCF practices from baseline and compared to control • ↑ mean score of correct practices carried out, 0 (no correct practices) to 10 (all correct practices): 7.60 vs 1.23, p=0.001 • ↑ WAZ: 0.31±0.39 vs -0.73±0.63
Oliveira et al., 2012 *Urban Brazil*	Mother-infant pairs along with infant's grandmothers if they lived together I: 16 mother-infant pairs C: 160 mother-infant pairs	Cluster RCT	Five nutrition counselling sessions on BF targeting mothers and grandmothers if they lived together from the time of birth to 120 days of life. A last counselling session (sixth) revolved around CF recommendations.	• Interviews with both mothers and grandmothers on infant feeding during the first 6 months of life	• Average time of non-breast milk and CF introduction: 153 days (95% CI: 114.6 to 191.4) vs 95 days (95% CI: 78.7 to 111.3) • ↓ consumption of non-breast milk (34.1% vs 56.9%), fruits (18.9% vs 32.5%), and salty pureed food (15.2% vs 26.0%) at 4 months, all at least p<0.05 • ↓ consumption of CF at 4 months: 22.8% (95% CI: 15.9 to 29.7%) vs 41% (95% CI: 32.8 to 49.2%)
Ogundele and Ogundele, 2015 *Peri-urban Nigeria*	I: 361 mother-child pairs C: 361 mother-child pairs (children aged -59 months)	Comparative, cross-sectional design	Comparison of CIMCI implementing and non-implementing communities CIMCI: community workers provide information on optimal IYCF practices	• Weight • MUAC • Questionnaire on IYCF practices, immunization, episodes of diseases, and household characteristics	CIMCI communities vs non-implementing communities: • 94.9% vs 78.1% infants started CF between 6-8mo, p<0.001 • WAZ: 3.6% vs 16.1%, p=0.000 • 86.1% vs 47.9% infants 6-23mo fed more than 3 times/day, p<0.001 • 6.5% vs 26.7% infants malnourished (MUAC <12.5cm) (p=0.007)

Palwala et al., 2009 *Urban India*	398 mother-infant dyads	Before/after intervention study	Intensive nutrition education • Participatory group education (3 over 6 weeks) on the importance of optimal nutrition, quantity, consistency, and frequency of CF. Sessions used audiovisuals, food displays, booklets • Weekly monitoring and reinforcement of IYCF practices (6 to 8 weeks)	• Checklist and food models to record IYCF practices (# of feedings, quantities, consistency) at weeks 5-6 (follow-up #1), 9-10 (follow-up #2), and 13-14 (follow-up #3)	3rd follow-up vs baseline • ↑ consumption of green leafy vegetables (87.6% vs 16.7%), carrots (52.1% vs 8.3%), and tomatoes (81.3% vs 52.0%) (all p<0.001) • ↓ consumption of tea and coffee (8.4% vs 50.1%, p<0.05) • ↑ amount of rice (113g±56 vs 62g±49), milk (202mL±256 vs 134g±210), eggs (29g±23 vs 20g±20), and fruits (82g±55 vs 41g±41) given (all p<0.05)
Roy et al., 2005 *Rural Bangladesh*	INE: 99 children INE+SF: 93 children C: 90 children Children aged 6-24 months	Prospective randomized trial	Provision of intensive nutrition education (INE) (2x/week) to caregivers alone or in combination with supplementary foods (SF) for a total of 3 months	• Weight, length • Food recalls • Episodes of disease recall	INE+SF vs INE vs control • WAZ: -2.15 in INE+SF vs -2.41 in INE vs -2.84, p<0.001 • increased cooking of complementary foods after 3-month intervention (97% vs 90% vs 6%, p<0.0001) and 6 months observation (92% vs 76% vs 6%, p<0.001)
Roy et al., 2007 *Rural Bangladesh*	I: 306 children C: 305 children Children aged 6-9 months at baseline	Cluster RCT	Focus group discussions on child growth, IYC care and feeding practices, and diseases with key recommendations given to mothers, over a period of 6 months	• Weight, length • IYCF practices of caregivers	6 months post intervention: • ↑ net weight: 1.81kg vs 1.39kg, p<0.001 • WAZ: -1.90 vs -2.15, p<0.001 • LAZ: -1.90 vs -2.15, p<0.002 • WAM >75%: 88.9% vs 61.5%, p=0.01
Saleem et al., 2014 *Peri-urban Pakistan*	I: 110 infants C: 84 infants 74 caregivers in control and intervention, total=148	Cluster RCT	3 home nutrition education visits on: (1) importance of BF and CF, hand-washing and hygiene, (2) BF promotion and CF consistency, and selection of CF, (3) recap of previous sessions and promotion of iron-rich and protein-based foods	• Z-scores calculations for stunting, wasting, and underweight • MUAC	Intervention vs control • ↑ weight by 350g (p=0.001) • ↑ height by 0.66cm (p=0.001) • ↑ MUAC by 0.46cm (p=0.002) • Reduction in stunting NS

Shi et al., 2009 *Rural China*	I: 294 infants C: 305 infants Aged ~ 3months at baseline Recruited from 8 randomized townships	Cluster RCT	Intervention delivered to caregivers: 1) Group training sessions on selecting and preparing foods, and optimal hygiene practices 2) Food demonstration sessions of weaning food recipes 3) Mothers provided with booklets on IYCF practices 4) Home visits every 3 months to reiterate IYCF messages and monitor current practices	Data collected at 3, 6, 9, 12, and 15 months • Questionnaire on mother's knowledge, IYCF practices, health of the child, and beliefs • Weight and length	• ↑ consumption of meats (96.9% vs 58.2%), beans, peas, lentils (92.1% vs 67.2%) green leafy vegetables (97.6% vs 87.9%), all p<0.001 • ↑ consumption of eggs (98.8% vs 92.2%), p=0.002 • ↑ mothers encouraged children to eat when they rejected food: 60.6% vs 16.9%, p<0.001 • ↑ number of meals at 12 months: 4.19 vs 2.90, p<0.001
Tariku et al., 2015 *Rural Ethiopia*	I-HBM: 56 mother-child pairs I-TM: 54 mother-chlid pairs C: 56 mother-child pairs Children aged ~11 months at baseline	Cluster RCT	2 intervention groups 1) home nutrition education intervention based on health belief model (HBM) constructs: perception of child's susceptibility to malnutrition, severity of malnutrition, benefits of optimal CF practices, and caregiver self efficacy to implement CF messages 2) Traditional method (TM) nutrition education targeting caregiver CF practices *Both home nutrition education sessions every 2 weeks for 3 months*	Data collected before and post-intervention • Questionnaire on CF practices and related constructs • CF practices measured based on: - Meal frequency - % of infants consuming from different food groups within last 24hr - Dietary diversity score	Post vs pre-intervention: • ↑ mean dietary diversity score in HMB group infants: 3.79±0.82 vs 3.05±0.94, p<0.05 • ↑ in HBM constructs in HMB group: - Susceptibility: 4.03±0.31 vs 2.78±0.67, p<0.001 - Severity: 3.54±0.71 vs 2.93±0.64, p=0.0325 - Benefit: 2.30±0.50 vs 2.03±0.60, p=0.0125 - Barrier: 3.09±1.03 vs 3.62±0.60, p=0.0015 - Efficacy: 2.28±0.37 vs 1.83±0.41, p<0.001 • ↑ in HBM constructs in TM group: - Susceptibility: 3.98±0.67 vs 3.62±0.94, p=0.0045 - Benefit: 2.96±1.12 vs 2.35±1.12, p<0.001 • ↑ in HBM constructs in control group: - Benefit: 1.35±0.46 vs 1.19±0.25, p=0.0015 - Efficacy: 1.91±0.16 vs 1.80±0.18, p=0.001

Vazir et al., 2013 *Rural India*	CF: 210 mother-child pairs RCF: 195 mother-child pairs C: 202 mother-child pairs From 60 villages	Cluster RCT	2 intervention groups: 1) CF group: standard care and key IYCF messages provided through home visits 2) Responsive CF group (RCF): standard care, IYCF messages, responsive feeding messages and skills, and messages on psychosocial stimulation Mothers and infants (starting at 3 months) were followed for 12 months	• Food frequency questionnaire • 24hr recalls • Questionnaires on caregiver IYCF knowledge (CF and RF) • Weight, length • Bayley Scales of Infant Development to assess motor and mental development • Hemoglobin • Morbidity data collected through recall • Maternal depression Data collected every 3 months from 3 months of age until 15months	RCF vs CF vs control • ↑ CF knowledge for both CF and RCF groups vs control group. E.g., of messages - Mixing rice and minced meat is good for an 8-month-old: 86.7% and 85.2% vs 55.2% - Egg is a good food at 9mo: 88.0% and 87.4% vs 61.7% - Liver is a good food for a 7-8month-old baby: 76.5% and 78.8% vs 44.0% All p<0.05 • RF knowledge NS between all groups • Liver: 33.7 and 38.0% vs 13.1%, p<0.05 • Poultry: 45.2 and 37.5% vs 18.9%, p<0.05 • Eggs: 77.7 and 73.9% vs 54.0%, p<0.05
Waswa et al., 2015 *Rural Kenya*	20 paired villages I: 110 mother-infant pairs C: 97 mother-infant pairs	Cluster RCT	4 nutrition education sessions providing group trainings and cooking demonstrations on: 1) importance of CF 2) dietary diversity of CF 3) nutrition and diversity of meals 4) preparation of meals	• 24hr dietary recalls • Child feeding practices: MDD, MMF, and MAD • Weight, length	Intervention vs control: • 87.3% vs 55.7% achieved MDD (p<0.001) • 98.8% vs 88.6% achieved MMF (p=0.019) • 87.8% vs 51.9% achieved MAD (p<0.001) • 71.8% vs 42.3% consumed meats, poultry, and fish (p<0.001) • Increased caregiver knowledge scores with increased number of education sessions (p<0.001)
Younes et al., 2014 *Rural Bangladesh*	21 meeting/162 women's groups (18 clusters) Pre-intervention survey I: 926 women C: 971 women Post-hoc survey I: 1082 women C: 1188 women	Controlled before/after intervention study	21 monthly women's groups on health issues in children less than 5 years: BF, undernutrition, vitamin A supplementation, immunizations, risks, common children diseases, and accidents and injuries	• Pre/post questionnaire on IYCF knowledge and practices • Calculation of difference-in-differences (DID)	• ↑ correct knowledge on EBF: DID 12.4%, 95% CI: 7.2 to 17.6, p<0.001 • ↑ correct knowledge on handwashing before preparing food (DID: 14.3%, 95% CI: 10.1 to 18.6) and feeding a child (DID: 32.0%, 95% CI: 26.9 to 37.2), both p<0.001 • ↑ EBF duration: DID 37.9 days, 95% CI: 17.4 to 58.3, p<0.001 • ↓ child illnesses in the 2 weeks prior to survey: DID -5.9%, 95% CI: -10.6 to -1.2, p=0.013

Zhang et al., 2013 *Rural China*	I: 294 infants C: 305 infants Aged ~ 3months at baseline Recruited from 8 randomized townships	Cluster RCT	Intervention delivered to caregivers: 1) Group training sessions on selecting and preparing foods, and optimal hygiene practices 2) Food demonstration sessions of weaning food recipes 3) Mothers provided with booklets on IYCF practices 4) Home visits every 3 months to reiterate IYCF messages and monitor current practices	• Weight and length • Questionnaire on mother's knowledge and IYCF practices	At 18 months: • ↑ WAZ: 0.18±0.90 vs -0.09±0.93, p=0.001 • ↑ WHZ: 0.49±1.07 vs 0.19±0.97, p=0.002 • ↓ Stunting: 3.2% vs 7.1%, OR 0.71, 95% CI: 0.53 to 0.94

ASF=animal source foods, BF=breastfeeding, C=Control group, CF=complementary feeding, CFR=Complementary feeding recommendation group, CIMCI=Community Integrated Management of Childhood Illnesses, DID=Difference-in-differences, EBF=exclusive breastfeeding, HAZ=height-for-age z-scores, Hb=Hemoglobin, HBM=Health Belief Model, HP=health professionals, HW=health workers, I=Intervention group, IMCI=Integrated Management of Childhood Illnesses, IYC=Infant and young children, IYCF=infant and young child feeding, INE=Intensive nutrition education, KAP=knowledge, attitudes, and practices, kJ=Kilojoules, LAZ=length-for-age z-scores, MAD=minimum acceptable diet, MDD=minimum dietary diversity, MJ=Megajoule, MMF=minimum meal frequency, MUAC=mid-upper arm circumference, NS=not significant, RCT=randomized controlled trial, RCF=Responsive complementary feeding, RF=Responsive feeding, SF=Supplementary foods WAM=Weight-for-age median, WAZ=weight-for-age z-scores, WHZ=weight-for-height z-scores

Table 2.2. Summary table of nutrition education interventions targeting health services

Authors and region	Participants (I: intervention, C: control)	Design	Intervention	Methods of measuring outcome	Results (intervention vs control/non-intervention)
Bassichetto and Rea, 2008 Urban Brazil	I: 29 HP C: 27 HP Pediatricians and nutritionists	RCT	40hr training – WHO Integrated course on IYCF (BF, CF) HIV, and IYCF, and counselling skills	• Questionnaire on HP profile • Questionnaire on IYCF counseling • Observation of counselling sessions and actions performed (measuring, weighing, taking of dietary history, and HP performance) Before and 2-months post-intervention	• 89.7% vs 33.3% of HP had improved knowledge ($p<0.001$) • Intervention HP had better knowledge in - BF: 79.3% vs 37%, p=0.004 - CF: 69.0% vs 37.0%, p=0.012 - Counselling: 51.7% vs 22.2%, p=0.004 Differences significant within groups (pre and post-intervention) and between groups at 2-month assessment
Pelto et al., 2004 Urban Brazil	I: 14 health centers C: 14 health centers 31 doctors 424 children <18 months	Evaluation study	I: 20-hour training on nutrition counselling C: refresher course on clinical training, no training on nutrition counselling	• Observation of 3 consults for each doctor • Home visits to assess maternal knowledge, maternal satisfaction of the services, and compliance with the recommendations, child dietary intake and anthropometry	• 75.6% vs 43.7% of consultations observed had at least 1 or more nutrition recommendation, $p<0.01$ • 45.9% vs 6.2% praised and checked mothers understood the information, $p<0.01$ • # of messages recalled by mothers: 90% vs 30%, $p<0.01$
Penny et al., 2005 Peri-urban Peru	12 paired health centers I: 187 infants C: 190 infants	Cluster RCT	Health workers trained in nutrition counselling and given key feeding recommendations + materials to use during counselling	• Weight, length, WAZ, HAZ at18 months • Caregiver knowledge • 24 hr dietary recalls	At 18 months • 52% vs 24% of mothers reported receiving nutrition counselling, p=0.002 • ↑ energy intake from ASF: ~350kcal/24hr vs ~240kcal/24hr, p=0.001 • improved length (p=0.014), and • ↑ LAZ: -0.8±0.8 vs -1.2±0.8, p=0.002 • Intervention children 3 times less likely to be stunted, p=0.018
Reinsma et al., 2016 Rural and urban Cameroon	I: 354 mother-infant pairs C: 415 mother-infant pairs	Cross-sectional evaluation	Nutrition Improvement Program (NIP): Training of certified food and nutrition professionals on nutrition counselling and assessment	• IYCF questionnaire to determine IYCF practices • 24 hr dietary recalls • Anthropometric measurements (weight, length)	• ↑ EBF: OR 6.9, 95% CI: 2.30 to 21.09 • CF practices NS different • ↑ risk of stunting in children 6-8 months attending non-NIP facilities: OR: 5.5, 95% CI: 3.37 to 9.02 (Children 0-5 months NS)

Robert et al., 2007 Peri-urban Peru	6 health centers of Trujillo, Peru	Process evaluation of RCT	Exploring the implementation of a cluster-randomized trial providing nutrition education within health centers – its delivery, adherence to protocol, and barriers to implementation	• Dose delivered: the number of activity carried out over the total expected • Fidelity: number of activities completed that followed protocol • Barriers to implementation • Context: qualitative evaluation of the environment in which the intervention was conducted	• Barriers included: high personnel turnover, low monetary resources, time constraints, low familiarity with feeding messages, and low caregiver attendance • Facilitators included: knowledge of malnutrition, benefits for the community, improved growth and development, and common language of messages
Samuel et al., 2016 Urban Nigeria	10 primary healthcare facilities 124 health workers	Before/After intervention study	• 2-day in-facility training session on IYCF recommendations, importance of individual counselling, and communication skills • training manual, posters, and handbills for HW	Questionnaires on • socio-demographics, KAP of IYCF recommendations of HW (baseline, after intervention, 4 weeks post-hoc) • socio-demographics of and services received by caregivers (baseline and 4-week post-hoc)	4-week post vs pre-intervention results • ↑ in mean knowledge scores immediately after the intervention compared to baseline, and 4-week post-intervention compared to immediately after the intervention (18.9±2.2, 20.1±2.8, 20.0±2.5), p=0.0001 • HW knowledge improved in terms of - Advantages of BF to infant: 10% vs 6% - BF difficulties: 56% vs 22% - Consistency: 42% vs 30% - Frequency at 6-8 months (44% vs 20%), 9-11 months (67% vs 40%), and 12-24 months (59% vs 49%) - Mentioning the minimum # of food groups that a baby should eat: 50% vs 20% - (All p<0.05)
Santos et al., 2001 Urban Brazil	I: 14 health centers C: 14 health centers 31 doctors 424 children <18 months	Cluster RCT	20h training of doctors in nutrition to then assess their knowledge, maternal knowledge, compliance with recommendations, and growth of children	• Questionnaire to test doctors' nutrition knowledge • Home visits to assess maternal knowledge, maternal satisfaction of the services, and compliance with the recommendations • Weight, height, and dietary intake of children	• ↑ average nutrition knowledge score of doctors: 83% (95%CI: 65 to 100%) vs 68% (95%CI: 48 to 88%), p=0.02 • ↑ appropriate recommendations: e.g., give chicken liver: 34% vs 7%; add butter or oil: 32% vs 0%; give beans: 36% vs 14%, all p<0.001 • ↑ praises given by trained doctors: 28.9% vs 17.7%, p=0.01 • ↑ caregiver satisfaction of care: 65.0% vs 53.4%, p=0.007 • ↑ food density of children diets 14.6% vs 3.4%, p<0.001 • ↑ intake of egg yolk (19.2% vs 8.2%), shredded chicken and beef (15.5% vs 6.3%), and chicken liver (20.5% vs 6.8%), all at least p<0.01

Vitolo et al., 2014 Urban Brazil	I: 9 health centers • 168 HP • 715 mothers and 619 infants 6-9 months C: 11 health centers	Cluster RCT	• 1h training to update HP on the Brazilian food guide and IYCF practices • HP provided with technical handbook, pocket guide, and educational material for caregivers • Banners with CF information and food pictures installed in the intervention health centers	• Household visits and interviews to collect data on weight, height, and dietary intake of infants	• ↑ EBF for first 3 months of life - 1 month old: RR 1.21, 95% CI: 1.08 to 1.38 - 2 months old: RR 1.29, 95% CI: 1.10 to 1.53 - 3 months old: RR 1.27, 95% CI: 1.04 to 1.56 (All p<0.05) • ↑ in meat consumption (≥4 times per week): RR 1.62, 95% CI: 1.30 to 2.03 (p<0.05) • ↓ consumption of non-breastmilk in the first 6 months of life - Soft drinks: RR 0.66, 95% CI: 0.54 to 0.80 - Coffee: RR 0.51, 95% CI: 0.31 to 0.85 - Cheese: RR 0.86, 95% CI: 0.75 to 0.98 - Chocolate: RR 0.66, 95% CI: 0.53 to 0.83
Zaman et al., 2008 Urban Pakistan	40 paired health centers I: 151 mother-child pairs C: 169 mother-child pairs	Cluster RCT	5.5 day-training of health workers on IYCF knowledge nutrition + practice sessions on communication and counselling skills	• Observation of counselling sessions (dietary assessment, recommendations, counselling skills) • Maternal recollection of feeding messages • IYCF practices • Weight and length measurements Data collected 2 weeks, 45 days, and 180 days post-intervention	• ↑ recommendations to mothers: 33% vs 4%, p=0.0025 • ↑ explanations for changes given: 29% vs 4%, p=0.0047 • ↑ praise given to mothers: 37% vs 8%, p=0.0075 • ↑ confirmed mother's understanding: 29% vs 2%, p=0.0046 • ↑ attempt to give eggs (48% vs 27%, p=0.0428) and meat (60% vs 40%, p=0.0508) • ↑ WAZ (-1.174±1.94 vs -1.720±1.27, p=0.012) and WHZ (-0.286±1.22 vs -0.794±1.15, p=0.0046) at 180d

ASF=Animal source foods, BF=Breastfeeding, C=Control group, CF=Complementary feeding, CI=Confidence interval, EBF=Exclusive breastfeeding, HIV=Human immunodeficiency virus, HP=Health professional, HW=Health workers, I=Intervention group, IYCF=Infant and young child feeding, KAP=Knowledge, attitudes, and practices, LAZ=Length-for-age z-scores, MAD=Minimum acceptable diet, MDD=Minimum dietary diversity, MMF=Minimum meal frequency, NIP=Nutrition Improvement Program, NS=Not significant, OR=Odds ration RCT=Randomized controlled trial, WAZ=Weight-for-age z-score, WHO=World Health Organization, WHZ=Weight-for-height z-score

3. Objective

While nutrition education interventions have targeted both caregivers and health professionals, those within health services are fewer in number. There is consequently a need for more information on the role of health professionals. As such, this research project was developed with the objective of gaining a better understanding of the health professional's role on caregivers' perceptions and understanding of key feeding messages provided to them within the health centers of Lambayeque. Ultimately, the purpose is to understand the role of health professional message delivery and how this may influence information dissemination and effectiveness of health education approaches worldwide. The research questions developed pertaining to this project were:

(1) How do health professionals and caregivers perceive their interactions in the context of a nutrition education intervention and how does it influence knowledge and practices?
(2) How do caregivers understand the messages delivered considering their current knowledge of children's feeding and care practices, traditions and culture?

4. Peru's health system

4.1. History of Peru's health system

Towards the end of the 1970s, Peru's political and social system transitioned from a more centralist regime towards a more decentralized regime (USAID 2006). This centralist regime, characterized by tolerance of authority, inequalities in social relations, concentration of territorial ownership, low levels of education, and marginalization of indigenous populations, had the ultimate goal of controlling the territory and benefiting the higher social class. As a result of population growth, migration, urbanization and the democratization of social relations, a political crisis was created and a process of decentralization and regionalization was initiated towards the end of the 1980's. Various responsibilities (e.g. infrastructures, finances, material resources, health) were then transferred to regional governments.

Prior to this, Peru's health system was characterized by its fragmented and discriminatory process and was organized according to an individual's socioeconomic status. Thus led to large inequalities in access to health services especially in rural areas. In 1960, the main source of health care was obtained within hospitals and over 50% of all hospitals were found to be concentrated in the urban regions of Lima and Callao (USAID, 2006). While health centers and

health posts also existed, only 117 posts and 213 centers were present in 1960, compared to 7124 posts and 2096 centers in 2013 (USAID, 2006; INEI, 2013).

Following the political decentralization, the health system and its legal framework was distributed amongst three governments: national, regional, and municipal. Consequently, health care was then under the supervision of four different auspices: the Ministry of Health (MINSA), EsSalud (Peruvian Institute for Social Security), the armed forces and national police, and the private sector (MINSA, 2011). Despite these changes, there remained inequalities in terms of establishments and human resources when comparing rural and urban areas. During the 1990s, expansion occurred and over 1169 health centers and 5316 health posts helped provide primary health care by the year 2000 (USAID, 2006).

Looking more specifically at maternal and child health, there has been an improvement in health care from the end of the 1980's until today. Between 1987 and 1991, over 50% of births occurred in mother's residences (INEI *et al.*, 1992). This is an indication of lower involvement of qualified health professionals. Specifically, 74.4% of urban births and 18.7% of rural ones were attended to by physicians, obstetricians, or nurses. Nowadays, health professionals handle almost all deliveries (89% of all births) (INEI, 2015). There are again discrepancies between rural and urban areas; 96.2% of urban births and 72.6% of rural births occurred in a health establishment and 97.3% of deliveries in urban areas and 76.3% in rural regions were managed by health professionals.

Despite considerable improvements in the number of establishments and the distribution of nurses, physicians and specialists, most of the work force is still concentrated in the Metropolitan region of Lima and urban regions along the coast of Peru (USAID, 2006). For instance, over 34% of nurses can be found in Lima and the number of physicians per 10,000 inhabitants in Lambayeque is about 2 to 3 times less than that available in Lima and Callao (2009 data) (MINSA, 2011).

4.2. Classification of Peru's health establishments

Peru's health establishments are categorized based on the level of care (primary, secondary, and tertiary) and level of complexity of services provided (MINSA, 2004). Primary, secondary, and tertiary level establishments are categorized as level I, II, and III health establishments, respectively, and their level of complexity goes from 1 to 8 (See Appendix I for the

categorization of health establishments). Primary level care facilities consist of health posts (I-1, I-2) and health centers (I-3, I-4), whereas secondary and tertiary level establishments are hospitals (II-1, II-2, III-1), and specialized institutions (III-2).

Health posts and health centers are primary level care establishments. Health posts are responsible for the health needs of their jurisdiction's population by providing comprehensive outpatient care that emphasizes health promotion, prevention of risks, and population participation (MINSA, 2004). Health centers in addition to integral outpatient care, are responsible for helping with recovery from more frequent health problems through the use of basic services of a superior complexity level than that found in a health post. Along with these roles, I-4 facilities should also be equipped for in-patient care. Specifically, these establishments should allow for short stays such as those having to do with parturition (Maternal-Perinatal field). As expected, I-4 health centers should provide services of a superior complexity level than what is found in I-3 health centers.

In terms of personnel, health posts are generally smaller and usually do not have physicians on site, but will have a nurse or a technician with a certain level of training in nursing. They may sometimes have an obstetrician. Health posts with a higher level of complexity (I-2) will have more personnel consisting of a nurse, an obstetrician, and technicians. Health centers will have some more comprehensive personnel with a family doctor or surgeon, a nurse, an obstetrician, a dentist, and technicians trained in the fields of nursing, pharmacy, laboratory, and statistics. Along with these health workers, I-4 level facilities will have specialists (obstetric-gynecologist, pediatrician), technicians in nursing, laboratory, pharmacy, statistics, and administration, and possibly a pharmacist.

5. Undernutrition in Peru

5.1. Health and nutrition profile of children under five years

Nutritional intake and undernutrition may be measured through different indicators such as weight-for-age and height-for-age z-scores, and stunting. In 2014, it is estimated that approximately 4.4% of Peruvian children under five were undernourished (as determined by weight-for-age) (INEI, 2015). This is a decrease by three percentage points from 1991-1992. However, rates were more than three times greater in rural compared to urban regions (8.5% vs 2.6%). Prevalence of stunting, another indicator of chronic undernutrition, reached 14.6% of

children under five years in 2014 compared to 17.5% in 2012-2013 reports, but once again was considerably higher in rural areas than urban areas (28.8% vs. 8.3%, respectively). Micronutrient deficiencies, such as iron deficiency and anemia, are also indicators of poor nutrition. In 2014, approximately 35.6% of children less than 5 years were anemic, which was a slight improvement from 2009 (37.2%).

Feeding habits and care practices in children less than 5 years are at the root of infant and young children (IYC) nutritional status. It has long been noted that most Peruvian mothers breastfeed their children (~94% in 1986 to 98.4% in 2014) and do so for extended periods of time (INEI *et al.*, 1988; INEI, 2015). For instance, in 2014, the average BF duration was over 20 months (urban: 20.3 months, rural: 21.6 months) (INEI, 2015). This is an increase from 30 years ago where BF lasted for approximately 13 to 16 months (INEI *et al.*, 1988). For its part, median duration of EBF was of 4.6 months in 2014 (urban: 4.2 months, rural: 5.1 months) whereas, in 1992, only 19.5% of 4-5 months old were breastfed exclusively (INEI, 2015; INEI *et al*., 1992).

Lastly, transition from BF and CF is usually considered to be the period where deficiencies occur and malnutrition rates increase rapidly (INEI, 2015). The majority of IYC less than 3 years (91.4%), who still received breast milk, consumed three or more types of different foods in 2014 (urban: 93.5%, rural: 88.4%). Complementary feeding practices seemed acceptable considering that the three main categories of foods consumed from 6-36 months of age were (i) meat, poultry, fish, and egg, (ii) cereals and grains, and (iii) roots and tubers.

5.2. Health and nutrition profile of children under five years in Lambayeque

Undernutrition indicators, feeding trends, and dietary intake in Lambayeque (northern Peru) generally follow national data with some slight differences. Stunting reached 14.3% in children less than 5 years in 2014, which is lower than the national average (14.6%). Anemia in children under five years living in Lambayeque (25.8%) was also lower than the national level of 35.6% (INEI, 2015).

Breastfeeding was practiced for 21.9 months in 2014, which is slightly higher than the average BF duration (slightly over 20 months) (INEI, 2015). Exclusive BF was the same as the national average at 4.6 months. Complimentary feeding practices demonstrated that a higher percentage of IYC aged 6-23 months were fed 3 or more different types of foods (95.4% vs 91.4%). An interesting finding was that Lambayeque is one of four rural regions which stand out for their

high percentage of IYC less than 3 years who consume foods rich in vitamin A (97.3% of IYC). Lastly, health care coverage in Lambayeque has increased from the 1980's and showed improvements. A lower number of home deliveries were noted in 2014 (~1.3%) than in 1992 (11.9%) and more births were attended to by qualified health professionals (93.3%) than in 1992 (32.7%).

The previous statistics illustrate that Lambayeque is not a region with the most severe prevalence of undernutrition; however nutrient deficiencies and growth faltering are still recognized by the regional government. In fact, it is in recognition of the undernutrition within their region that the regional government requested an intervention be put in place to improve IYC nutritional status within its four poorest districts: Morrópe, Salas, Incahuasi and Kañaris (IIN, 2013). This initiative called "Breaking down the barriers – improving nutrition and health counselling services to facilitate behavior change in Peru" was started in 2012 and provides nutrition education sessions and nutrition-related activities in each four districts' health centers to improve feeding and care practices of caregivers. This was accomplished by training health professionals working in the centers (doctors, nurses, nutritionists, obstetricians, and technicians) in effective delivery of messages, cultural adaptation of counselling, and by educating them on specific feeding messages. All four districts have health services where nutrition activities are provided, mainly through the growth monitoring and promotion program (CRED). Individual and group demonstrations educate caregivers on proper IYC feeding and care practices.

6. Manuscript

Effective transfer of nutrition messages to caregivers by health service providers trained in counselling in two poor districts of the Lambayeque region, Peru

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6.1. Abstract

Objective. Inadequate feeding practices contribute to the high rates of anemia in Peru (43.5% of children 6-35 months). In response, the Lambayeque regional government funded a train-the-trainer initiative in its four poorest districts to improve the skills of health service professionals (HP) in effective nutrition education counselling. The objective of the present study was to identify influential factors on effective transfer of improved nutrition practices to caregivers, including interpersonal relationships between HP and caregivers.

Methods. Data were collected in six health establishments in two of the four selected Lambayeque districts. We completed in-depth interviews with 5 HP, and 34 exit interviews with caregivers, of whom 7 gave in-depth interviews and 5 also permitted home observations. In addition, 29 direct participant observations of visits to the child growth and development monitoring program were conducted to observe the counselling.

Results. The category of personnel influenced the type of nutrition messages and amount of detail provided, with nutritionists targeting dietary diversity, food consistency, and frequency of feedings and nurses focusing on how to use multi-micronutrient powders and increase consumption of iron-rich foods (e.g., liver, *sangrecita*). Positive verbal communication (e.g., praise) and non-verbal language (e.g., smile) of HP made caregivers feel more comfortable when attending the health services. Learning materials (e.g., model plates) and group demonstration sessions facilitated caregiver comprehension, whereas caregivers' Quechua language was a barrier. Challenges that affected the continuity of good counselling in the health services were the frequent rotation of health service personnel and access to the health services, especially nutrition services. Lastly, cultural beliefs prevented the adoption of some messages for a few of the caregivers (e.g., consuming animal blood (*sangrecita*) is comparable to consuming the animal's soul).

Discussion. Barriers and limitations to health service-based nutrition education were identified. The results of this study provide an insight into how HP-caregiver interactions influence how mothers make use of nutrition services offered to them. Both HP and caregivers were invested in improving infant and young child feeding practices. However, frequent change in personnel contributed to the lack of continuity of the nutrition services offered within the health establishments. The regional government should continue to train HP to assure that they have the

skills for effective counselling and efforts should be placed in introducing training for effective nutrition counselling as part of all HP's formal training.

6.2. Introduction

Vulnerability to undernutrition increases from the time a child is six months of age as breastmilk becomes insufficient to meet nutritional needs and complementary feeding (CF) practices are suboptimal (Lassi *et al.,* 2013; Majamanda *et al.,* 2014). As such, efforts have been placed in improving both caregivers' infant and young child feeding (IYCF) practices as well as health professionals' (HP) nutrition knowledge and communication skills.

The majority of nutrition education interventions found in the literature are community-based and have demonstrated improvements in caregiver knowledge, infant and young child feeding (IYCF) practices, and child growth. Monthly meetings for 21 months for 162 women's groups in rural Bangladesh were organized for mothers to explore matters relating to health of children under five years (BF, immunization, common childhood diseases) (Younes *et al.,* 2014). Mothers who participated in the discussions demonstrated improved knowledge on exclusive breastfeeding (BF) (DID 12.4%, 95% CI: 7.2% to 17.6%) and breastfed their children exclusively for longer periods of time (DID 37.9 days, 95% CI: 17.4d to 58.3d) (both $p<0.001$). In Kenya, mothers were invited to attend four group education and food demonstration sessions on CF (dietary diversity, nutrition and diversity of meals, and preparation of meals) and their children were found to have improved dietary intakes (Waswa *et al.,* 2015). Specifically, more than an increased 30% of intervention children achieved a minimum dietary diversity and consumed foods such as meats, poultry, and fish (both $p<0.001$). In rural China, local nutrition educators were trained in nutrition counselling to conduct monthly home visits and counsel caregivers on IYCF practices for a period of one year (Guldan *et al.,* 2000). Exclusive BF rates increased by approximately 10% and growth parameters improved. Weight-for-age z-scores (WAZ; -1.17 vs -1.93, $p=0.004$) and height-for-age z-scores (HAZ; -1.32 vs -1.96, $p=0.02$) increased and about 10% less intervention children were anemic at the end of the study ($p=0.008$).

Health services-based interventions have been fewer in number but have led to increases in coverage of nutrition services and improvements in HP nutrition knowledge and counselling skills. Health workers from six Peruvian health centers were trained in nutrition counselling and

given key feeding messages to disseminate to caregivers along with counselling materials (Penny *et al.*, 2005). Double the number of mothers who attended facilities with trained personnel reported having obtained nutrition information (p=0.002). Additionally, children who attended intervention centers displayed slower decreases in length-for-age z-scores (LAZ; -0.8±0.8 vs -1.2±0.8, p=0.002). In a similar Pakistani intervention, training of health workers resulted in more recommendations being given to mothers (33% vs 4%) and more explanations provided for the need to change practices (29% vs 4%) (both p<0.01) (Zaman *et al.*, 2008). Trained health workers demonstrated better communication skills by praising mothers when they reported an appropriate action (37% vs 8%) and confirming mothers understood their recommendations (29% vs 2%) (both p<0.01). The researchers also found intervention children had better growth parameters with improved WAZ (-1.174±1.94 vs -1.720±1.27, p=0.01) and weight-for-height z-scores (WHZ) (-0.286±1.22 vs -0.794±1.15, p=0.005).

While these studies demonstrate the ability of health service-based interventions in strengthening HP nutrition knowledge and counselling skills, there is a need to address the issue of rapport between caregivers and professionals. Only one study reported on caregiver satisfaction of the services (Santos *et al.*, 2001). However, there is relatively no information on how this influences caregiver attendance and their use of nutrition services. As such, this study intended to gain a better understanding of the role of health professional message delivery and professional-caregiver relationships and how these helped shape caregivers' utilization of services and their ultimate understanding of key feeding messages provided within the health centers of Lambayeque.

6.3. Methods

6.3.1. Study sites

The study was conducted in the Lambayeque region of Peru. Lambayeque is one of Peru's 24 departments and is situated in the northwest of the country, along the Pacific coast. As of 2015, the population of Lambayeque had reached 1,260,650 people (INEI, n.d.(a)). The total land coverage of Lambayeque amounts to 694,070.12 hectares of which 254,458.41 is arable land used by 59,102 farmers. The majority of farmers (~57 k) have 0.1 to 5 hectares of land. Taking into account all of Peru's departments, Lambayeque is the second greatest producer of sugar cane and the third greatest producer of rice (2008 estimates) (INEI, 2009) .

Looking at education levels in the Lambayeque population 25 years and older, women had completed an average of 9.4 years of schooling compared to 9.8 for men (INEI, n.d.(b)). In 2015, approximately 5.8% (95% CI 4.8 to 7.0) of the population over 15 years was illiterate (INEI, n.d. (c)).

Lambayeque is subdivided into three provinces: Chiclayo, Ferreñafe, and Lambayeque. Data collection took place in the districts of Mórrope in the Lambayeque province, and Incahuasi in the Ferreñafe province (see Appendix IIa for a map of the Lambayeque region).

Mórrope district

The district of Mórrope is located close to the capital of the department of Lambayeque, Chiclayo. Transport between Mórrope and Chiclayo takes approximately 1 hour using the local transport system. This is available at high frequency (every 10 minutes or so) from early in the morning until nighttime. As of 2015, there were 46,046 people living in the district, of which 5,495 were children less than 5 years (INEI, 2015).

The district is composed of multiple villages which are accessed using the local transport system. Data collection was undertaken in the health establishments of four of these villages, namely: Caracucho, Positos, Cruz del Medano, and Mórrope. The health establishments of these four villages were chosen due to their higher number of personnel working in CRED[7] than other villages.

Incahuasi district

The district of Incahuasi is considered part of the Andean geographic region and sits at approximately 3,100 meters above sea level (Municipality of Ferreñafe, 2011). Of the 15,518 inhabitants, 2,031 are children less than 5 years of age (INEI, n.d.(a)). The majority of the population communicates in Quechua, a native language spoken by some of Peru's indigenous population, and have limited knowledge of Spanish (Municipality of Ferreñafe, 2011).

The majority of the data were collected from the health post of Uyurpampa, with some data from the health center of Inkawasi, the capital of the district of Incahuasi. Most of the data were obtained from Uyurpampa as a greater proportion of the population speaks Spanish in Uyurpampa. Depending on the establishment in charge for the primary health care of their

[7] CRED: *Crecimiento y Desarrollo*, growth monitoring and promotion program

village, people who do not live in Uyurpampa or the capital of Inkawasi have to travel, often by foot, for access to health services.

6.3.2. Participants

Participants in the study were recruited from six health establishments of the districts of Mórrope and Incahuasi. Caregivers present in the health establishments at the moment of the data collection and attending CRED were asked if they wanted to participate in a brief exit interview in relation to their visit to CRED. These caregivers had to be 18 years or older and have a child 6 months to 3 years of age. Of the participants who agreed to an exit interview, those who were more forthcoming in their answers and who were willing to talk about the services were asked if they wanted to participate in home observations and in-depth interviews.

Health professionals involved in the CRED program were also recruited from the health establishments. Specifically, nurses and nutritionists were asked to participate in observations of their counselling sessions and in-depth interviews.

6.3.3. Data collection

Data collection was completed during the months of July and August of 2016 by the primary researcher (MBC) and a research assistant native to Peru who was fluent in Spanish but did not speak Quechua. Methods of data collection included direct participant observations of the counselling sessions, exit and in-depth interviews with caregivers, home observations, and in-depth interviews with the health personnel (see Appendix III for a summary of data collection activities). Prior to data collection, questionnaires to be used in the exit and in-depth interviews and observations guides were created based on pre-existing themes and guides used within the context of a larger intervention in the region. The expectation before the start of data collection was that at least 15 exit-interviews would be completed in each district.

Direct participant observations: A total of 29 direct participant observations were completed. Participant observations of CRED counselling sessions were conducted to examine the nutrition messages provided to caregivers and the interaction that occurred between the health personnel and the caregivers. We also wanted to take note of whether health professionals applied the information provided to them through trainings by the regional health government (GERESA[8]).

[8] GERESA: *Gerencia Regional de Salud*

The observations served to gather an understanding of the physical environment of the health establishments where the services are provided. We collected information on the logistics behind nutrition education activities: the types of nutrition activities provided, how these activities were performed (what health professionals were present, did they use any teaching materials, how was the interaction with the caregivers), how many people assisted these sessions, and how the activities were organized (how do people learn about the different activities, do they have to take an appointment) (see Appendix IV-a for the observation guide). Observations were completed from the position of a "participant-as-observer" as the purpose of our presence was known by both the investigator and the participants (Gold, 1958). Observations lasted from 20 to 45 minutes. An observation guide was put together before the start of data collection to help note specific aspects of the counselling session. This guide was based on a previously existing guide used in another project looking at the health services (Bartolini, "Breaking down the barriers – improving nutrition and health counselling services to facilitate behavior change in Peru"). Lastly, detailed notes of the observations were written and then transcribed before being analyzed.

Exit interviews with caregivers: Exit interviews were conducted with 34 caregivers coming out of a counselling session with a nurse or nutritionist. We sought to know what nutritional information had been given to them along with their ability to comply with those recommendations. We also sought their opinion of the health services: namely, how they felt during the counselling session, if they were comfortable, and if they understood what was said to them (see to Appendix IV-b, for the exit interview questionnaire). Exit interviews were also used to assess the caregivers' level of retention and comprehension of the nutrition messages provided to them. The interviews were done at or near the health establishment and lasted less than 5 minutes. While the expectation was that 15 interviews would be completed in each district, only six came from the district of Incahuasi. This is further discussed in the limitations of the study.

In-depth interviews with caregivers: Semi-structured, in-depth interviews with caregivers consisted of a longer discussion on the health services they attended. In-depth interviews were complete with 7 caregivers of the 34 who had agreed to an exit-interview. Since caregivers have a crucial role in their infants' nutritional status, we wanted to explore their perceptions of the health services. We sought to obtain more information on the services offered to caregivers, the health personnel who provide patient care, their relationships with the health personnel, and how

comfortable they feel in their interactions with them. We also wanted to gather information on the nutrition messages given to them, their comprehension of the messages, and what may facilitate or hinder the practice of recommendations (see Appendix IV-c for the in-depth interview questionnaire for caregivers). These interviews were recorded and conducted in the caregiver's home to allow for a home observation at the same time. A day and time, usually around lunch, was arranged before going to the caregiver's home. The interviews lasted around 20 minutes.

Home observations with caregivers: Of the seven caregivers who agreed to an in-depth interview, five caregivers agreed to home observations. Home observations were carried out to observe the caregiving habits with their child and to see whether the nutrition messages provided in the health establishment were practiced in the household. Specifically, we observed caregivers' cooking and feeding practices with their children to take note of what foods were given and how they were fed to the children. We stayed for approximately 3 to 5 hours during which we conducted the observation and the in-depth interview with the caregiver.

In-depth interviews with health professionals: Five health professionals participated in in-depth, semi-structured interviews to obtain their thoughts on: the services they provided, the trainings obtained from the *GERESA*, the messages they disseminated to caregivers, their opinion of the caregivers' comprehension of the messages, and the overall functioning of the services and improvements they would like to observe (see Appendix IV-d for the in-depth interview questionnaire with health professionals). The interviews were recorded and conducted in the health establishment at a time set by the health professional to accommodate their schedule and lasted approximately 20 minutes.

6.3.4. Data analysis

The pre-existing themes used for the formulation of the questionnaires and observation guide included the health establishment environment, the interactions between caregivers and health professionals, and beliefs or traditions. Once data were collected, all information recorded during interviews and noted during observations was transcribed manually and saved in password-protected files. Thematic content analysis was then conducted to identify additional themes emerging from the information gathered. Thematic content analysis consists in "identifying, coding, and categorizing the primary patterns in the data" (Patton, 1990, p. 381). All transcribed information along with field observations was organized and categorized manually. Once organized, the information was analyzed for common themes.

Taking example from a participatory action model, preliminary results were presented to stakeholders within the regional government at the end of the data collection period to validate some of these findings.

6.3.5. Ethical approval

Ethical approval was obtained for all data collection from both the McGill University Research Ethics Review Board and the Nutrition Research Institute (IIN[9]) Ethics Committee in Lima, Peru. Informed verbal consent was obtained before exit interviews and signed consent was obtained before in-depth interviews, and observations. Refer to Appendix V for the Ethics Certificate.

6.4. Results

6.4.1. Description of the health establishments

Health posts and health centers differed in the personnel they had and the level of care they provided to their population. For each health establishment visited during the data collection period, observations on the opening hours and the personnel and services available are provided below.

In general, while the establishments were opened to patients of all ages, the majority of patients consisted of children less than five years old. In each of the establishments, caregivers arrived early to take their child's medical file and wait to see the nurse (or other services). Generally, caregivers were given a date at which they needed to bring their child back to the health center

[9] IIN*: Instituto de Investigacion Nutricional*

but no specific appointment, unless it was with a specialized service such as Nutrition. For specialized services such as Nutrition, caregivers were either referred by the nurse or the doctor if their child seemed to have health concerns like anemia, low WAZ, and/or low HAZ, or the caregiver went to see the nutritionist directly if she wished to consult with her.

While schedules differed from one establishment to the next, there was no attention on Sundays, as these days were reserved for what is called '*guardias'*. Nurses, nutritionists, and other HP visited households within the community whose children had missed their checkup by more than a week. These visits also served to verify things such as use of iodized salt and to distribute multi-micronutrient supplements (MMN) or vitamins. On Sundays, one or two HP, who were not doing visits within the community, were present in the health establishments in case of emergencies.

Whereas some of the personnel working in the establishment were permanent, others were recently graduated students who were completing a one-year national service. These are usually completed outside of a metropolitan city and in a rural area. It is called the Rural and Peri-urban National Health Service (SERUMS)[10] program where HP are '*serumistas*'. Every month of May and October, new *serumistas* come in to complete their one-year national services. There is therefore an overlap between older *serumistas* who come in in May and those who come in in October. This is the case for all of the health personnel (doctor, nurse, nutritionist, obstetrician, dentist) who wish to work in government establishments such as health posts, health centers, and hospitals. Because of the constant rotation that occurs, the manager of the health establishments is not necessarily always a doctor but could be a nurse or a technician who is a permanent staff and lives in the community.

District of Mórrope

Health Center Mórrope. The Mórrope health center is the largest and most equipped health establishment in the district of Mórrope. It is also the managing center over the rest of the establishments in the district. Meetings held with the personnel of the district's health centers and health posts occur in the health center of Mórrope. Additionally, there is an office in the

[10] SERUMS: *Servicio Rural y Urbano Marginal en Salud*

health center dedicated to data entry where data from all the district's health establishments are compiled and sent to the regional government for statistical purposes.

The center was open seven days a week and 24 hours a day in case of emergencies. There was an ambulance for cases that needed to be transferred to the local hospital in Lambayeque. It offered various services including: medicine, growth promotion, pharmacy, laboratory testing, psychology, dental services, obstetrics/maternal care and family planning, psychology, and outpatient services. These services were provided by a team of HP which included: doctors, nurses, a nutritionist, technicians in pharmacy, technicians in nursing, administrative assistants, laboratory technicians, dental surgeons, obstetricians[11], and a technician in statistics.

While the center was open to all of Mórrope's population, the majority of patients were children attending CRED, aged zero to three, and older children aged up to eight to ten years old. Caregivers generally brought their children for their regular check up or for any type of illness or discomfort (e.g., fever, diarrhea, cold). The health center also received patient transfers from surrounding villages' health establishments which did not have the equipment or the personnel to care for more serious accidents or illnesses.

The CRED nurses provided patient care Mondays through Saturdays in two shifts; from 7 am to 1 pm and from 1:30 pm to 6 pm. For nutrition services, the nutritionist was there for consults Mondays through Saturdays from 7 am to 1 pm. According to the nurses, approximately 30 children are seen through the CRED program every day.

At the time of data collection in July 2016, the nutritionist in the health center of Mórrope was a *serumista* who had recently started her national service at the beginning of May 2016. She provided patient care from Tuesdays to Saturday from 7 am to 1 pm and carried out visits in the community on Sundays. Being the only nutritionist in the center, Mondays usually served as her day off. In addition to meeting with patients, the nutritionist organized food demonstration sessions.

Physically, the center was composed of several separate one-story buildings. The main building contained the offices for medicine, growth promotion, psychology, outpatient services, the main waiting room, and a washroom (see **Figure 6.1** for a map of the center). To the left of that

[11] Obstetricians, psychologists, and laboratory technicians were not physicians in training but professionals licensed in these domains.

building was the nutritionist's office. The last building to the left of the nutritionist housed the pharmacy, the admission's office, where patients obtained their medical histories, and the managing doctor's office. To the right of these three buildings was another structure which consisted of an open space with chairs, children's toys, and a bathroom. It was usually used for carrying out food demonstrations. The last of the buildings making up the center was towards the back of the lot and housed the maternal, dental, and laboratory services.

The health center was the only health establishment in the village of Mórrope. It was surrounded by houses and some small businesses. From the capital of the department, Chiclayo, it took approximately 45 minutes to get to Mórrope and then approximately five minutes to walk from the bus stop to the health center.

Health Center Cruz del Medano. The health center of Cruz del Medano was the second biggest in the district. It offered services of medicine, growth promotion, pharmacy, laboratory testing, psychology, dental services, obstetrics/maternal care and family planning, psychology, and outpatient services (See **Figure 6.2** for a map of the center). It also had an ambulance in cases of emergency. The health personnel were mostly permanent and included nurses, doctors, a nutritionist, obstetricians, a dentist, a psychologist, technicians in nursing, technicians in pharmacy and a laboratory technician.

The center was opened from Mondays to Saturdays and there was patient care during the morning from 7:30 am to 12h30 pm and from 12h30 pm to 6h30 pm. Normally, nurses started to see patients at around 8 am in the morning and at 1h30 to 2 pm in the afternoon as mothers were normally busy preparing lunch and did not come to the health centers until after 12h30 pm. On Sundays, the personnel carried out their visits to community households.

The nutritionist was a permanent member of the health staff in the center. Her work schedule varied from week to week and patients could consult her schedule on a public board if they wished to see her. She normally worked mornings or afternoons only, but did work full days once in a while. Apart from consulting patients, the nutritionist also organized food demonstration sessions.

The center was composed of only one two-story building. On the first floor, one found the admissions' office, the services of medicine, growth promotion, family planning, outpatient services, and pharmacy. The building was almost perfectly square in shape and all the offices

made up the different sides of the building, leaving the center open for the waiting room. As the waiting room was spacious and had enough seats, it served as a room for food demonstrations. Going up the stairs to the second floor, one could find the services of nutrition, dentistry, psychology, and the laboratory, in addition to the chief physician's office.

While a little isolated away from the center of the village, the health center was situated close to the road where cars drove by on their way to Mórrope. It was only surrounded by some houses and was the only health establishment in the village. It took approximately 15 minutes to get to the health center of Cruz del Medano from the village of Mórrope.

Health Post Caracucho. The health post of Caracucho was smaller than both health centers previously described. It offered services of medicine, growth promotion, obstetrics, dentistry, and outpatient services and counted on a permanent staff of one nurse, one doctor, one obstetrician, and three technicians in nursing, in addition to a temporary (*serumista*) doctor and dentist. The health post was opened from Mondays to Saturdays from 7h30 am to 1h30 pm. Sundays were reserved for visits to the community.

Most patients who attended the health post were children under five years old. During our time in the health post, the primary school students were brought over to have their hemoglobin (Hb) levels measured using Hemocue. At the same time, each child received a bottle of ferrous sulphate syrup and anti-parasitic medicine to bring home with them. A paper is supposed to be stapled to each child's agenda with instructions for parents to know when and how to give the supplement. Each child's Hb level was written down and the data were brought to the health center of Mórrope, where they were to be compiled with the rest of the district's data. This procedure of testing students' hemoglobin was said to occur twice a year. The nurse who is in charge of CRED was also responsible for carrying out food demonstrations within the community.

The health post was situated on the main street in the village. Facing the health post, on the other side of the street, was the primary school where the students would come from. In between the health post and the school stretched a small plaza. Other buildings on either side of the health post and the primary school were mainly houses with a handful of small businesses. The health post itself was a one-story building that was crowded and dusty inside because of the frequent passage of cars and motorcycles on the main road (See **Figure 6.3** for a map). At the time of data

collection, construction workers were leveling the street in preparation to put down asphalt, which created additional noise and dust. It took approximately 20 min from Mórrope to get to the health post of Caracucho.

Health Post Positos. The health post of Positos offered services of medicine, growth promotion, obstetrics, laboratory testing, pharmacy, and outpatient services. The personnel were composed of a *serumista* doctor, a permanent obstetrician and nurse, one laboratory technician who came to the health post three days a week, and two technicians in nursing. The health post provided patient care Mondays to Saturdays from 7 am to 1 pm and Sundays were reserved for visits within the community. Despite not having a nutritionist on site, food demonstrations were still organized, as was done by the doctor and the obstetrician in a neighboring village while we were present for the data collection.

During data collection, the majority of the patients were children less than five years of age. Despite being smaller in their personnel and in the number of services offered, many patients came in to the health post while we were there. Most were waiting to be seen in CRED while the rest were consulting with the obstetrician or the doctor. This may have been due to the fact that the nurse had been on vacation for the two weeks prior to our arrival.

The building was composed of two floors. All services were found on the first floor except for the laboratory which was on the second level (See **Figure 6.4** for a map). The health establishment was situated on a street close to the center of the village and was surrounded by houses and faced fields.

To travel to the health post of Positos, one had to go from Chiclayo to the village of Tucume (not Mórrope) and take a car from the village of Tucume to Positos. The trip from Chiclayo to Tucume took approximately 45 minutes to one hour, and from there it was about 15 minutes to the health post of Positos.

District of Incahuasi

The district of Incahuasi is further away from the capital of Chiclayo and is situated more inland, part of the mountainous region of Peru. Using the local transport system, it took approximately 6 hours to arrive in Uyurpampa, one of the main villages within the district of Incahuasi. Transport to and from Chiclayo is available only once a day in the morning. People who do not live in the

villages of Uyurpampa or the capital, Inkawasi, have to travel there, often by foot, for transport to Chiclayo.

Health Post Uyurpampa. The health post in Uyurpampa offered services of medicine, growth promotion, obstetrics, dentistry, pharmacy, laboratory testing, and outpatient services. These services were offered by a staff of *serumistas* composed of two doctors, two nurses, one obstetrician, and one dental surgeon, and a permanent staff composed of a laboratory technician, three technicians in nursing, one health technician, and one technician in transport who drives the ambulance in cases of emergency. Patient care was provided Mondays to Saturdays from 7h30 am to 1h30 pm. On Sundays, the personnel completed visits to the community. The nurse who was in charge of CRED took care of food demonstrations within the community. The health post of Uyurpampa has eight villages under its jurisdiction. Patients had to walk more than one hour at times to get to the health post.

The health post constituted of two one-story buildings situated on the main road and close to the entrance of the village (See **Figure 5** for a map). Across the road from the health post were primary and secondary schools and a corner shop. Continuing further down the road inside the village, one could find the center surrounded by small corner shops, a restaurant, a small hostel, and houses.

Health Center Inkawasi. The health center of Inkawasi offered services of medicine, growth promotion, dentistry, obstetrics, psychology, laboratory, and outpatient services. The staff working in the center was mostly temporary and included one doctor, one dental surgeon, two nurses, two obstetricians, one psychologist, and one laboratory technician, whom were all *serumistas*. The permanent staff was composed of one nurse, three technicians in nursing, two drivers, and a service auxiliary. Nurses provided patient care throughout the day from 7h30 am to 1h30 pm and from 1h30 pm to 7h30 pm. The afternoon shift usually started at about 2 to 2h30 pm because of nurses going on lunch. The center was found around the main plaza of the village of Inkawasi along with a church and some small businesses.

6.4.2. Nutrition information provided within health services

Caregivers of children 3 years and younger who attended the health services normally received nutritional information from nurses and, if available in that particular establishment, from nutritionists as well. The messages given to caregivers targeted dietary diversity, consistency of

the foods, frequency and quantity of feedings, and even the responsiveness of mothers toward their children when feeding them. Some examples of messages are provided in **Table 6.1.**

Table 6.1. Sample of nutrition messages given through the health services of the Lambayeque department.

Type of message	Examples of messages
Dietary diversity	"Eat foods rich in iron, like liver, meat, *sangrecita*[12], fish, legumes." "Eggs can be given too. But the egg yolk only, not the egg white." "We need to eat our fruits and vegetables" "Fruits like banana, papaya, mandarin." "The last message is 'eat vegetables', at least three times a week. What vegetables can be obtained in Cruz? Lentils, peas, Lima beans…"
Frequency and quantity of feedings	"As the child grows and gets older, the quantity of food should increase: from 6-8 months, they should eat three to five tablespoons of food, from 9-11 months, five to seven tablespoons, and when they are one year, the child should eat a full plate."
Consistency of foods	"From six to eight months, the consistency needs to be thick, not watery." "Your child eats chopped foods now? Because he has teeth. No baby food/mush. Right, Maria[13]?" "The consistency should be like on the plate, chopped, not like soup. He needs to learn how to chew since he will be one year old and at one year he starts to eat full plates." "At one year, he should eat from the family pot."
Responsive feeding	"It is important to be more patient." "It's important to have enough patience."

[12] *Sangrecita*: curdled blood that is cooked and which may be seasoned with different spices.

[13] Names mentioned throughout the text have been modified for anonymity's sake

Anemia is an important concern in this region and emphasis is put on the consumption of animal-source foods, foods high in iron such as liver, meat, *sangrecita*, chicken, fish, and legumes, and the multi-micronutrient supplements (MMN). To help prevent micronutrient deficiencies and delayed growth, caregivers are provided with MMN to be mixed in their children's food. These are sachets of powdered micronutrients containing iron, zinc, vitamin A, vitamin C, and folic acid provided to caregivers by their local health establishment. They are instructed to give them to their children on a daily basis from the time a child is six months of age until they are three years old.

Data obtained from interviews and home observations have shown that caregivers did put in practice the recommendations given by the HP. Additionally, caregivers demonstrated that learning about feeding their child was helpful to them. See **Table 6.2** for responses from caregivers interviewed.

Table 6.2. Caregiver responses on usefulness of the information received within health services

Do you believe the information that you receive will help you take care of your child? Why?
"Yes, yes it does help us learn more as a mother."
"Yes, because it helps understand some of the subjects we don't understand."
"Yes, because she tells me how I am supposed to feed [my child]."
"Yes, it is always good to come so as to refresh your memory. With all the things that one has to do every day, we forget and it is good to come and remember."

Delivery of the information varied based on different aspects of the health services and the community and interactions between HP and caregivers played a role in how caregivers used said health services.

6.4.3. Variations in the delivery of the nutrition information

Efficient information translation from the health personnel to caregivers was dependent on different aspects and included: the type of personnel providing the information, the verbal and non-verbal communication that occurred during the counselling sessions, the materials used by the personnel to disseminate the information, and the type of counselling with which the messages were given to caregivers.

Type of health personnel

Nutrition education was firstly influenced by the type of personnel who was counselling the caregiver. Nurses and nutritionists differed in the details of the nutrition information they provided. While both touched on aspects of dietary diversity, consistency, and quantity, nutritionists were more inclined to give greater details and offer explanations for their recommendations as is demonstrated in this excerpt from an observation of a nutrition consult:

> The nutritionist mentioned to the parents that consistency is important because their daughter does not have teeth yet. […] She then says that when preparing her food, to add butter to it as this will give her more energy.

Nurses were more succinct in their nutritional recommendations. When visiting a nurse for one of her daughters, a caregiver was told that "of all your daughters, she is the only one with a low height. I recommend that you improve her nutrition, with her more than with your other girls." The nurse however did not give any details on how to improve her daughter's dietary intake. There was also a focus on intake of foods high in iron and MMN. Specifically, nurses would reiterate that the MMN had to be consumed in "two tablespoons of thick food [which can be] potato, arracacha, carrot, pumpkin, cassava. All of the sachet. […] One sachet per day, [which could] be at breakfast or lunch."

The difference in the comprehensiveness of the messages translated in the caregiver remembering more of the information when asked about it during exit interviews. When asked about the nutrition information provided to her following a visit to the nutritionist, a mother relayed she had "to feed him well, and give him milk. Give him liver, potato, rice. Porridge. He has a low height and low weight and I have to feed him well so he can gain weight. He has to eat more chopped foods, like potatoes, carrots, vegetables, meat." In contrast, a mother who visited

with a nurse indicated she had been told she "need[ed] to give his multimicronutrients to help his weight. Give him lentils, legumes, with his liver…a lot of legumes."

With regard to gathering information on care and feeding habits, both nurses and nutritionists asked questions on what caregivers would feed their children. However, nutritionists investigated further and asked what was given at each meal and how much. This served in tailoring their recommendations and offering solutions or alternatives to actions which were not optimal:

> The nutritionist asked the mother what her child eats in a day.
>
> […]
>
> The mother said he then eats at 11am: "soup with vegetables, liver, and noodles, banana. At 3 pm he has his porridge. Then at 6 pm, he has fish, with cassava, and oatmeal." The nutritionist responds with "very well" and then asks about quantities.
>
> […]
>
> Later on, the nutritionist talks about consistency, once again using the model plate, saying the consistency should be as it is seen on the plate – chopped foods, and not the consistency of a soup. He needs to learn how to chew since he will soon be one year old and at one year old he starts to eat full plates. She adds that "he won't be able to achieve that with soups. With chopped foods, not soups."

In this other example, the nutritionist noted that the child was not eating enough at each meals and recommended that the mother "feed him six meals a day [instead of three]" and that she "have more patience and give him more during the day."

Nurses did probe mothers on what they fed their children albeit not always in as detailed a manner. Where nurses and nutritionists differed most was in their recommendations. Nurses gave general advice mostly regarding foods high in iron and the MMN. They also presented nutritional recommendations as rigid messages and did not offer solutions to potential dietary issues mothers faced:

> […] The nurse turned to foods rich in iron and asked the mother if she gave him liver. Mother responds saying she does not. Nurse says she

> has to add it to his diet, along with spinach, potatoes saying "you have to include foods of animal origin, organ meat, from now on."

In terms of the information itself, inconsistencies of recommendations were noted during a nurse's CRED sessions. On two separate occasions, caregivers were told that breastfeeding should be stopped at six months and that another type of milk be given the child. Additionally, when mentioning that their child had eaten a mandarin, they were told not to give citrus fruits before the age of one year as citrus fruits were not recommended before the age of one year for risks of allergies and for risks of cavities.

In short, the scope of the nutrition information differed depending on the type of personnel giving the nutrition education with nutritionists being more complete in their recommendations. Caregiver were consequently more detailed in their recounting of the nutritional advice received.

Verbal and non-verbal language of the personnel

Part of understanding interactions between individuals included looking at verbal and non-verbal communication. During observations of the CRED sessions, the verbal and body language used by the health personnel was examined. These differed from one HP to the next and influenced how caregivers took advantage of the health services and their views of the health personnel they interacted with.

In general, verbal interactions between the personnel and caregivers were formal and polite in nature. Both HP and caregivers addressed one another using "*usted*", a formal way of calling someone. As the consult advanced and caregivers became more comfortable, HP would sometimes use "*tu*" instead of "*usted*" which is considered less formal but still polite. Mothers' given names and terms of endearment were also used such as *amor,* which translates to "love", and *mija,* or *mi hijita*, which means "dear". On a few occasions, fathers accompanied their wife to their child's check-up during which it was observed that the personnel tended to be more formal with them and avoid the use of "*tu*".

Throughout the consult, different attitudes were expressed. Some HP were more patient and caring when counselling caregivers. They focused on a topic, took the time to ask about feeding habits and waited for caregivers to respond. Mothers would be praised with a "very well" and even complimented at times: "[She is] a responsible mother [who] has brought her child to all of

his check-ups." When feeding habits were not optimal, these HP would propose a change and normally give an explanation as to why this change was necessary.

In terms of non-verbal communication, some HP demonstrated a better approach with caregivers by maintaining eye contact when talking with them and smiling more frequently. Music would sometimes be played in the consult room and one nurse paid attention to have children's music. This sort of non-verbal language along with a calmer attitude and verbal approach helped caregivers feel comfortable when attending the services. **Table 6.3** presents some of the caregivers' responses to this question.

Table 6.3. Caregiver responses to why they felt comfortable attending the health services

Did the nurse/nutritionist make you feel comfortable during the consult? Why?
"Yes. Because she has patience with children."
"[Yes.] You can see she masters her subject."
"Yes, [because] she talks [to you] as if she was talking to anybody."
"Yes, because when I came in, she smiled, and said 'Hello, Lili [daughter]'. She put her music for children…"
"Yes, because of the way she treats you. There are others who scream at you."

Other HP were less composed, more impatient, and would jump from one topic to the next during a consult. When inquiring about feeding habits, questions tended to be asked in a rapid manner: "What are you giving him? Does he eat fish? Meat? Chicken? Liver?". The fact that HP seemed "to be in a rush" also did not encourage caregivers to ask questions. When caregivers would report on their child care habits, these HP tended to make comments with negative connotations and would reprimand caregivers at times. For example, when a mother responded that she did not give liver to her child, the nurse went on to tell her she "had to include ASF, organ meat, from now on," and that mothers "don't [do] what they are told. Foods that contain iron? No, you throw them out. Fish? No."

The way caregivers are treated when attending the health services and their consequent level of comfort influenced their attendance to the health establishments. For instance, a 24-year-old

mother reported attending a different health post than the one in the village she lived in as she "received better treatment here, with more trust" compared to the other center where the HP "reprimand[ed her]."

Some of the health personnel was conscious of the fact that caregivers may not take full advantage of the health services for various reasons and tried to ensure this does not happen. One nutritionist mentioned that "talking to [caregivers] like they are your friend [helps in making them listen to your recommendations]. I try to make friends with the mothers, especially those whose children are at greater risk, so that they come to the center and won't say I am not coming back." This demonstrates the awareness of the personnel and the effort they put in improving the reach of the services within the community. Both verbal and non-verbal language conveyed by the personnel played a role in how enjoyable the caregiver's experience was and how this modified how they made use of the services.

Use of materials

HP working in the health services of Lambayeque had at their disposal different materials including model plates, posters, flipcharts, and pamphlets or handouts. Through observations and interviews, it was determined that, on the one hand, these helped caregivers remember more of the information given to them and, on the other hand, helped HP in the dissemination of the nutrition information.

Model plates were representations of a typical plate a child should eat based on their age group. For instance, it is recommended that children six to eight months eat about two to three spoonfuls of pureed foods at least three times a day in addition to breast milk. The model plate consequently depicted a small portion of pureed beans. These plates were useful as they not only showed what types of food a child may consume but the quantities and consistencies in which they should be eaten. A HP was observed using the plate to demonstrate and emphasize the consistency of the food to parents of a six-month-old about to start CF saying "the food should be smooth; it shouldn't have any chunks in it."

Various *posters* could be found inside the consult rooms. In rooms used by nurses, one could find a poster depicting the developmental milestones a child should reach at different ages and a poster on the various vaccines given at specific ages. In the nutritionist's room, a poster on anemia listed symptoms of iron deficiency and foods that served in alleviating this. Nutritionists

and nurses also had access to a set of posters where general nutritional recommendations are written. These recommendations include: (1) It is important to make foods of good consistency appropriate to your baby's age, (2) As your child grows and gets older, the quantity of the food should increase, (3) Your child should eat foods rich in iron (liver, *sangrecita*, meat, fish, legumes) everyday and consume their supplement (ferrous sulphate, MMN), (4) It is important to eat our fruits and vegetables, and the last message was to (5) eat legumes, at least three times a week.

Flipcharts contained detailed information about CF. For each age group, six to eight months, nine to eleven months, and twelve months and above, nutritional advice was given for the different food groups. It indicated what foods should be consumed, in what quantity and consistency. Additionally, it provided recipe ideas for certain foods like liver.

Lastly, *handouts* contained brief nutritional information for mothers to take home with them. There were handout materials on EBF, CF, and MMN. The pamphlet on CF gave brief information about which foods from each food group could be included in a child's diet for each age group; the quantity of food that should be fed to a baby; and the frequency at which they should eat. This same pamphlet mentioned the practice of handwashing, when and how to do it and reminded caregivers to add the MMN to their baby's food. A last handout informed the caregivers on what are the MMN and described the steps for preparing them. It also indicated where one could find each of the micronutrients in everyday foods (e.g., iron can be found in liver, *sangrecita*, chicken; vitamin A can be found in liver, milk, egg yolk).

Despite having didactic material at their disposal, most of the health personnel did not make use of them when counselling caregivers. However, data collected revealed that HP did consider the didactic materials facilitators to nutrition education as it helped mothers understand the information given to them (Refer to **Table 6.4** for HP responses on what facilitates nutrition education). Nutritionists made use of the didactic materials while nurses only sometimes handed out pamphlets to mothers.

Table 6.4. Health professionals' opinions on what facilitates nutrition education

What are some aspects or factors that seem to facilitate nutrition education?
"[Materials] help you because it is part of trying to be…that [the process] be didactic, so that [mothers] can understand [the information] better. So they make it easier for the mother to understand you […]"
"Everything that is demonstrative"
"The [ministry] gave us brochures, they also gave us simulation material on how one can give a proper diet […]. These are model [plates] that also help in that the mother understands a little better."

Nutritionists always made use of materials while counselling mothers and those included model plates, posters, flipcharts, and handouts. Most nurses counselled caregivers through verbal communication only with some handing out materials on complementary feeding or MMN preparation at the end of the session.

In a more interactive situation, one nurse made use of those pamphlets by having caregivers read the CF information back to her. She then asked mothers which of those foods had they given to their children. This translated in caregivers being more specific in recounting the recommendations the nurse had shared with them. For example, a caregiver reported being told that "MMN replace legumes, that it is important to give vegetables and fish. And that he [his child] has to eat differently as he continues growing." However, this did not seem to be the norm as mothers who attended this health establishment were later interviewed and said that the nurse usually simply weighed and measured their children but did not really discuss their nutrition.

The use of model plates seemed beneficial as caregivers were again more specific in the reporting of information. Caregivers who reported that the HP had used "the plates with the food" said one "can see what quantity we are supposed to give them," and "how much he should eat for his age." During an interview, mothers mentioned that the use of materials made it easier for them to understand what is being said as it is demonstrated while talking. All in all, use of materials was beneficial for both caregivers and HP as it helped in the transmission and understanding of the nutrition messages.

Counselling Type

Different types of counselling were used by HP including one-on-one counselling, food demonstrations, and home visits. Each were shown to add to the ensemble that is nutrition education within the communities.

Food demonstration sessions were unanimously considered by HP as more beneficial than individualized sessions in making sure caregivers understand the messages as these provided visual support to the education: "Demonstration sessions [are useful] because, in one, you are talking and, in the other, they can see the texture, see how it is prepared…". In addition, demonstrations added an interactive dimension by having mothers serve as volunteers to present the plates of food to other caregivers in the audience. They also had the opportunity of tasting the food themselves and feeding some to their children. While demonstrations had their benefits, one-on-one counselling sessions were also valuable as caregivers ask more questions when alone with the HP than when they are in a group: "They do not ask questions in public…In public, they say 'yes, I understood' but they didn't understand anything, and so often, we personalize it so they talk a little more". However, these demonstrations and counselling sessions need to be carried out to impart those benefits and some caregivers reported never having had one performed in their village.

Lastly, *guardias*, or home visits, were opportunities to provide educational information and follow up on children who did not attend their check-up. Home visits were also an occasion for HP to discuss with family members who may impose their decisions on the household:

> "[We] try to reach the family too. Because the family is the one who […] takes the decisions. The mother-in-law, because the majority of girls who get married do not live in their house, they live with the mother-in-law. Therefore, everything is imposed by the mother-in-law. And, as such, we try to, well, to talk. This is why, in the home visits, we talk and there we meet the family. For them to know and try to […] change this way of saying 'no, yes, this you can eat…'."

In conclusion, the different types of counselling that were carried out within the district allowed for a more comprehensive nutrition education to take place and allowed for a greater reach of caregivers and family members within the community.

6.4.4. Role of the environment in information translation

Location of the health establishment

Data were collected in two different districts of Lambayeque: Mórrope, which is relatively close to Chiclayo, the capital of Lambayeque, and Incahuasi, which is more isolated and further away from the capital. In terms of food availability, the district of Mórrope had a greater variety of foods than the district of Incahuasi, especially ASF. The village of Mórrope had its own market where one could purchase fruits, vegetables, ASF, and other goods such as bread and cereal. While not directly on the Pacific coast, Mórrope is closer to the sea than Incahuasi and had access to fish. Fishermen drove around the district to sell fresh fish directly to households. Families also had small parcels of land where they grew vegetables and cereals. Different markets were available for caregivers to do their groceries. Within the district, the biggest market was that of Mórrope where most caregivers would purchase their food. Some smaller villages also had their own smaller markets. In addition to those, the cities of Lambayeque and Chiclayo both had larger markets with an extensive selection of foodstuffs.

In contrast to Mórrope, access to food in Incahuasi was limited due to a low number of markets and poor variety of the foods that were present. Fruits and vegetables were brought in from Chiclayo in limited quantities; bananas, mandarins, and sometimes papayas were said to be brought up depending on the season. Households there also had parcels of land where they mostly grew cereals. In Uyurpampa, potatoes, lentils, and some cereals were cultivated. In Inkawasi, carrots were also reported to be grown. In both districts, most families raised animals including chickens, ducks, pigs, sheep, cows, and guinea pigs. These animals were used for work as well as consumption of their products, such as their meat, milk and eggs, and for production of other foods such as cheese.

Differences were identified in relation to the location of both the health services and of the household. Firstly, food access differed between the two districts but also within the district. In addition to the market of Mórrope, smaller markets were found in other villages. While food quantity and variety was limited, these markets facilitated access to some foods for those who did not have the time or means to travel to Mórrope, Chiclayo, or Lambayeque. Some people did take advantage of Chiclayo's and Lambayeque's proximity to purchase food from their more

extensive markets. This was highlighted during an interview with a nutritionist who, when asked about the purchasing patterns of caregivers in the village, responded that:

> "The majority of mothers go to Mórrope or to Chiclayo [to buy their groceries]. […] Sometimes they go [to Chiclayo] once or multiple times a week and take advantage of the fact that they are travelling to do their groceries. But, since [the village] has its own little market that is open everyday, they do have the possibility to buy [food]. A few of the things they don't have, well then they go to Chiclayo."

Not all villages however had their own markets and caregivers did not have access to some foods recommended by the HP. This was highlighted when two sisters-in-law were asked whether there were able to carry out the nurse's recommendations in their household:

> Maria: Yes, concerning the foods, sometimes there aren't [enough] to give them different [kinds] everyday
>
> […]
>
> Julia: The majority [of the people] here will have a soup with their –
>
> Maria: Main meal
>
> Julia: With their main meal. Vegetables sometimes, fruits also when there are some
>
> Maria: When there aren't any [fruits and vegetables], no
>
> Julia: When there aren't, no
>
> […]
>
> Julia: There are [no markets] around here […] Only in the city.

Secondly, availability of the health services varied between the two districts. Where in Mórrope, multiple health establishments were found within the various villages, there were not as many in Incahuasi and these were responsible for multiple villages. Additionally, for the establishments that were available, services were not as specialized as in Mórrope. No nutritionist was available in neither the health post of Uyurpampa nor in the health center of Inkawasi. The location also affected how HP counselled caregivers in relation to nutrition. Recognition of the restricted food

availability in the village made HP tailor their counselling by "recommend[ing] that they (caregivers) adjust to the means they have. When they kill the chicken, give the liver. When they kill the guinea pig, same."

A last barrier associated with the region of Incahuasi was the language. Most of the population spoke Quechua and the HP coming from the city of Chiclayo did not speak the language:

> "Some [of the population] do not speak Spanish, more Quechua and that is one of the barriers that is…very permanent here [in Incahuasi], because we can't communicate with the patient […]."

In short, the location of the health establishments introduced modifications and barriers to the health services that were provided within the two districts. Depending on the region, restricted food access inhibited caregivers from fully complying with the nutritional recommendations and location dictated the availability and access of services to the population.

The environment surrounding the health establishment

At the institutional level, observations of the services and interviews with caregivers and HP uncovered some of the issues present within the health establishments. From the caregiver's point of view, the health services were not always reliable in terms of schedules and punctuality of the health personnel. In one health post, where CRED services were to be offered starting at 7 a.m., patient care only began at approximately 8 or 8h30 a.m. This increased the waiting times for caregivers who presented themselves early in the morning to avoid longer waits. Different mothers have expressed that waiting times are long when attending the health services: "It does not move; they need more personnel for…well for all [of the services]. They need more nurses." One of the nutritionists in Mórrope also highlighted this issue and that "some patients get delayed when retrieving their patient histories [and] decide not to come and see me." Lastly, mothers revealed that HP are not present at times to deliver patient care due to them either being on vacation or simply absent on that particular day.

For HP, the health establishment can be a challenging environment due to their unfamiliarity with the personnel and the community, and the high work load they carry. The majority of nurses and nutritionists working in the CRED program of rural establishments are *serumistas*. Some had only arrived in the community two months prior and others had been there for approximately

nine months at the time of data collection. This had implications for both the HP and the caregiver. Newly-entering HP were concerned with productivity and carrying out the counselling sessions and food demonstrations: "When I first arrived, my preoccupation [was] productivity […]". However, they do not know the community and the key individuals to help put the event together:

> "I didn't think that a budget would come in as early as it did in the month that I arrived. And they told me, 'you need to give out that money'. If I hadn't received the support of others, […] for example the [chief-nurse], who helped me a lot as I didn't know the promoters in the community who, thanks to them as well, I was able to carry out the [demonstration] session."

In addition to this, there is little to no transfer of information between the exiting and the incoming *serumistas*. In the case of nurses, where there were normally at least two in a health establishment, some overlap did take place as there is a six-month period between the arrival of a new HP and the departure of the older HP. On the other hand, there was only one nutritionist and hence no interaction between the outgoing and incoming HP. This resulted in some of the HP, both nurses and nutritionists, not being aware of some of the customs that may exist within the community or the materials they had at their disposal. When asked whether the previous nurse had told her or showed her there were model plates she could use, a nurse in Incahuasi relayed that this had not been the case and that she had encountered them when looking for something in the consult room: "No, this pointing to plates) I found".

In terms of work load, every service in the health establishments had patient quotas to fulfill which they reported on to the regional health government (*GERESA*[14]) on a monthly basis. For specialized services such as Nutrition, achieving these quotas partly depended on patient referrals from other services such as medicine and CRED. This introduced a barrier for HP as "sometimes, professional jealousy exists […]" and the "health personnel do not [encourage them to come]".

[14] *GERESA*: *Gerencia Regional de Salud*

The high personnel turnover also caused repercussions for the caregivers. Similar to the *serumistas* having to familiarize themselves with the community, mothers had to adjust to new nurses and nutritionists on a regular basis. This affected how caregivers made use of the services as they preferred to wait and see the HP they were used to seeing, as was mentioned by a newly-arrived nurse in Uyurpampa.

The sum of these institutional barriers hinder the proper functioning of the different services and create a lack of fluidity between said services. Patients may not take full advantage of what is offered to them for lack of referrals or due to dissuading factors such as long wait times. On the other hand, HP's capacity may not be optimal due to high workloads, unfamiliarity with the community, and frequent change in personnel.

The caregiver's home environment

Prior to going into the field, data collection tools were developed based on pre-existing themes. These themes were thought to be able to modify how and whether or not caregivers would put in practice nutritional recommendations given to them through the health services. One such theme was the *caregiver's environment* or *reality* which included their economic status, beliefs that exist in the community, the idea of social hierarchy, and the role of family.

The first point to make in relation to the caregivers' home environment was that data collected reflected that both Mórrope and Incahuasi are regions of low resources. While all of the district of Mórrope is considered to be a region of poverty, different levels of poverty were present within the community. Home observations helped recognize this variation in that some households had possessions such as a refrigerator, a cooking stove, concrete floors, or a television, while other households were more rudimentary and had dirt floors, walls made of adobe, and cooked using fire for lack of cooking appliances. This lack of financial resources was reported by a caregiver who mentioned that "sometimes, there is no money to buy [liver]" and comply with the HP's recommendations. In both Incahuasi and Mórrope, HP were aware of the low financial resources available to the population and tried to make sure their recommendations allowed caregivers to make the most of what they had.

In addition to having low financial resources, caregivers displayed some beliefs that conflicted with the recommendations of the health personnel. During a CRED session, a nurse noticed the child's grandmother was also anemic and recommended she eat foods like liver, meat, and

sangrecita to which the grandmother responded she could not consume the latter because the religion she belonged to did not allow it. This same issue was expressed by a nutritionist who stated: "We recommend foods rich in iron and *sangrecita* is one of those […] It is a food that is inexpensive, a food that they can use. But, for religious reasons, no. Or rather, some religions say that no, no they can't consume the blood of the animal because, well, because it contains the soul of the animal." Along with religious beliefs, social hierarchy also had its repercussions. This was illustrated when a mother was asked whether there was something else she had wanted to discuss with the nurse to which she responded: "No…because it was late and I was shy to ask her for more information." On a separate occasion, another mother mentioned that she had not asked any questions out of shyness.

6.5. Discussion

The present study helped identify three levels of barriers to effective transfer of nutrition messages: (1) challenges associated with the caregiver's reality, (2) health personnel issues, and (3) barriers associated with the health services. At the caregiver level, language spoken affected comprehension of the messages. In Incahuasi, HP's lack of Quechua language skills hindered the effective passage of information and prevented most mothers from asking questions. This limited how well the caregiver understood the information and her ability to put into practice the recommendations given to her. In a South African study, language was recognized as an important hurdle to the access and quality of healthcare and to beneficiaries' comprehension of recommendations (Hunter-Adams and Rother, 2017). In-depth interviews and focus group discussions were conducted with African migrants who had accessed South African healthcare services and revealed that differing languages between provider and patients played a role in patients' comprehension of care messages and treatments. Place of residence was another barrier associated with caregivers' realities as it determined mothers' access to markets and the extent to which caregivers complied with the recommendations. In Mórrope district, some villages did not have any markets, obliging families to travel to neighboring villages or cities to purchase food. In Incahuasi, no markets were available and families depended on the crops and animals at their disposal and foods that were brought up from Chiclayo. In general, the personnel were aware of these restrictions and encouraged caregivers to provide recommended foods when they were available to them. For instance, when mothers would kill an animal (e.g., chicken) they were advised to give some to the child, even if this was not an everyday occurrence. The same was

said for vegetables that were grown by caregivers such as potatoes, carrots, and lentils. In an analysis of data from Indonesia, Kenya, Ethiopia, and Malawi looking at smallholder farms and food production, it was found that production diversity was indicative of higher dietary diversity (Sibhatu *et al.*, 2015). Another study which gathered physician perceptions on the mandatory national service completed in rural areas of Ecuador reported that language was one of the barriers to the health care they provided as physicians could not understand their patients (Cavender and Alban, 1998). Specifically, farms that produced one other type of crop or raised an additional type of animal demonstrated a 0.9% increase in dietary diversity ($p<0.001$). However, the interesting finding out of this analysis was that dietary diversity was also improved when households had better market access. It was estimated that a 10-kilometer decrease in distance between the household and the market could lead to the same improvement in diet diversity as increasing the number of crops or animals raised. This demonstrates that market access plays a significant role in dietary quality of caregivers and their children.

At the HP level, counselling differed between nutritionists and nurses. Nutritionists went more in-depth in their recommendations tackling issues of dietary diversity, frequency, and consistency of meals. They were diligent in asking about current IYCF practices. Nutritionists also made use of didactic materials (e.g., posters, flipcharts, model plates, and handouts) that helped caregivers visualize the information and understand it better. Together, these made for tailored recommendations based on current practices and which the mother could grasp more easily. Nurses focused on MMN supplementation preparation and iron-rich foods (e.g., *sangrecita*, liver, meat, fish) and would sometimes give handouts to help caregivers remember the information discussed. After Peruvian health workers of six health establishments were trained in quality counselling and nutrition education, children who attended these intervention centers were found to be three times less likely to be stunted at 18 months (Penny *et al.*, 2005). An evaluation of the feeding messages given to caregivers attending centers where the personnel were trained also revealed that a greater number of key nutritional recommendations were provided by nutritionists than by other HP (H Creed-Kanashiro, personal communication, July 5th, 2017). Furthermore, the use of materials was also found to be beneficial in a Brazilian study where HP were given a one-hour refresher training on IYCF practices (Vitolo *et al.*, 2014). More specifically, each trained HP was given educational materials to give to caregivers along with banners to display in the health center. These materials emphasized the importance of meat

consumption that was found to be higher among children whose caregivers had been counselled by trained HP compared to those not trained (RR 1.62, 95% CI: 1.30 to 2.03, $p<0.05$). The distinction in counselling between HP may originate from the fact that formal training in nutrition differs for nutritionists and nurses and knowledge is thus more developed in one than in the latter. Additionally, it could be argued that the workload of nurses is higher as the CRED program not only looks at nutrition and growth but also takes care of vaccinations and child development. Nurses spent an average 15 minutes with caregivers where they would address episodes of illnesses (e.g., cough, cold), dietary intake, growth and development, and administered vaccines when these were due. In contrast, nutritionists' counselling sessions generally lasted longer at approximately 20 to 30 minutes where the sole focus remained on the child's dietary intake.

Attendance at the health services was affected by the attitude of the personnel. The HP's negative attitudes expressed towards caregivers led them to seek out services from different health establishments than the ones to which they were assigned. Considering that caregivers generally attend their village's establishment, seeking out a different health center normally implies increased travelling distances and time. This potentially decreases caregivers' frequency of attendance and consequently reduces their exposure to information. In other cases, it discourages caregivers from attending the health services, using them only in cases of emergency. In a Brazilian study, doctors were trained in nutrition counselling and the use of good communication skills such as asking questions, listening to caregivers, and praising them (Santos *et al.*, 2001). After the intervention, researchers noted that an increased 10% of trained doctors praised mothers compared to untrained doctors and this, along with improved recommendations, translated to more mothers being satisfied with the health services (65.0% vs 53.4%, $p=0.007$). Satisfaction of the services is a salient feature in determining utilization of said services as it is a manifestation of expectations having been met (Karim *et al.*, 2016). After developing a questionnaire to determine people's perception and satisfaction of Bangladeshi health services, interviews revealed different associations between satisfaction and service utilization. Notably, caregiver satisfaction related to HP's attitudes and communication skills (adjusted OR: 1.08, 95% CI: 1.02 to 1.14) and satisfaction of preventive and promotive service (adjusted OR: 1.09, 95% CI: 1.01 to 1.19) were both significantly indicative of greater utilization of community clinics.

High personnel turnover was also found to be an impediment to the transfer of nutrition messages. Many health professionals were completing their one-year national service directly after finishing their degree (e.g., nursing, nutrition) and hence had limited professional experience and knowledge of the community in which they worked. For nutrition services, there was little transfer of information between the outgoing and incoming professionals in terms of materials available to them and familiarity with the community as there was at most only one nutritionist working in a health establishment. Transfer of information occurred a little more with nurses as there were normally at least two nurses working in a center and a 6-months overlap between the departure and entry of a new HP. Vitolo and colleagues (2014), whose IYCF intervention was described previously, found that rates of EBF increased by at least 20% but only for the first three months postpartum when mothers were counselled by trained HP. The researchers hypothesized that this small increase in EBF may be due to a high personnel turnover thereby reducing the number of trained professionals and caregivers' exposure to this recommendation as new HP were not given the refresher training on optimal IYCF practices. In our study, frequent changes in the personnel also had implications for the community that had to adapt to new personnel yearly. In fact, some caregivers preferred to wait to be counselled by the HP that had been there a longer period of time. Periodic replacement in personnel was found to be a barrier in another institution-based nutrition education intervention (Robert *et al.*, 2007). Robert and colleagues (2007) sought to understand the barriers and facilitators of Penny and colleagues' intervention (2005) in which health workers of Peruvian health centers were trained in counselling and nutrition education and found frequent changes in personnel to be an impediment as there was little interchange between arriving and departing HP; this did not allow for continuity of the services provided.

Lastly, at the institutional level, attendance to the nutrition services was dependent in part on the organization of others services in the health facility. Long wait times were highlighted by caregivers and HP as a hindering factor to attending counselling sessions. Exposure to nutrition information could be intensified by ensuring that all the different nutrition activities are performed within the health services including individualized counselling sessions, educational sessions, food demonstrations, and home visits. The lack of some activities (e.g., food demonstration sessions, group education sessions) and the inadequacy of home visits was

highlighted by caregivers who mentioned they would appreciate if those were offered in their health establishment.

6.5.1. Limitations of the study

The first limitation of this study is in the methodology used for data collection. Observations can be difficult to document and rely on memory. To ensure the accuracy of the data collected, the observers were diligent in transcribing the information on a daily basis immediately after data were collected. A second limitation is the "observer effect" where the presence of the researcher encourages a change in participant behavior (Patton, 1990, p. 244). As such, some of the behaviors observed in the health services may not have been a true reflection of what normally goes on during counselling sessions. This was addressed by triangulating the data that were collected and comparing notes between what the HP did and reported, and the information caregivers reported to us. Thirdly, while data were collected by two individuals, data analysis was completed by one person. Because of the nature of the work, interpretation of the results may be subject to the investigator's biases. This risk was reduced by first validating preliminary results with key stakeholders working at the *GERESA*, and, second, by triangulating the data collected from different sources and methods.

6.6. Conclusion

While nutrition education literature provides information on personnel counselling skills and attitudes following training, only one study looked at caregiver satisfaction of the services (Santos *et al.*, 2001). There is, however, little information on how HP attitudes displayed during counselling sessions affect the HP-caregiver relationships and consequent use of the services by caregivers. The results of this study provide an insight into how these interactions influence how mothers make use of nutrition services offered to them. Observations and interviews conducted in this study revealed that both HP and caregivers were invested in ensuring that children receive proper nutrition for optimal growth. The transfer of messages was more effective when HP made use of the didactic materials available and used positive verbal communication and supportive body language. This supported caregivers' comprehension and encouraged them to put in practice the nutrition messages in their households. The high personnel turnover contributed to the lack of continuity of the nutrition services offered within the health establishments. The regional government should continue to train HP to assure that they have the skills for effective

counselling and efforts should be placed in introducing training for effective nutrition counselling as part of all HP's formal training.

7. Figures

Figure 6.1 Diagram of Health Center of Mórrope

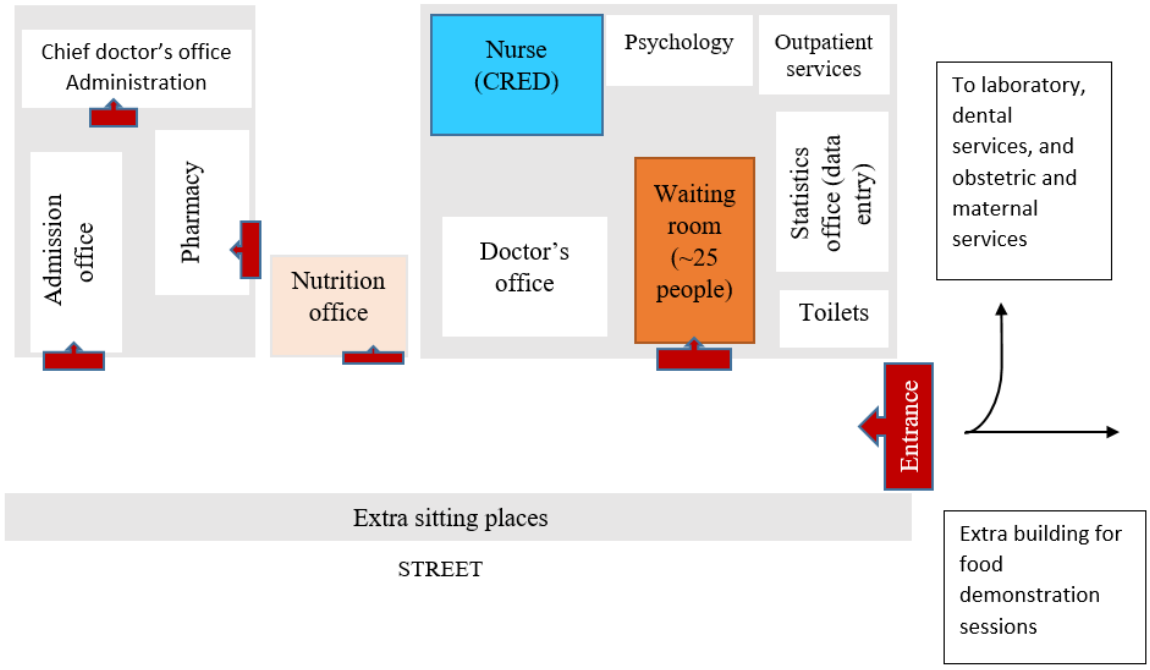


Figure 6.2 Diagram of Health Center of Cruz del Medano

Figure 6.3 Diagram of Health Post of Caracucho

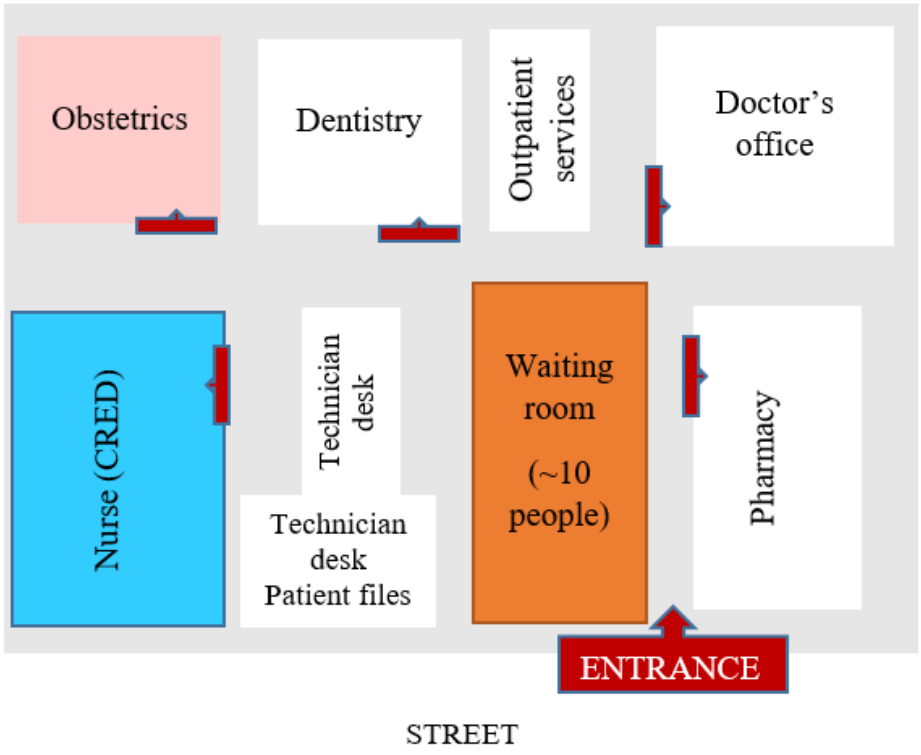


Figure 6.4 Diagram of Health Post of Positos

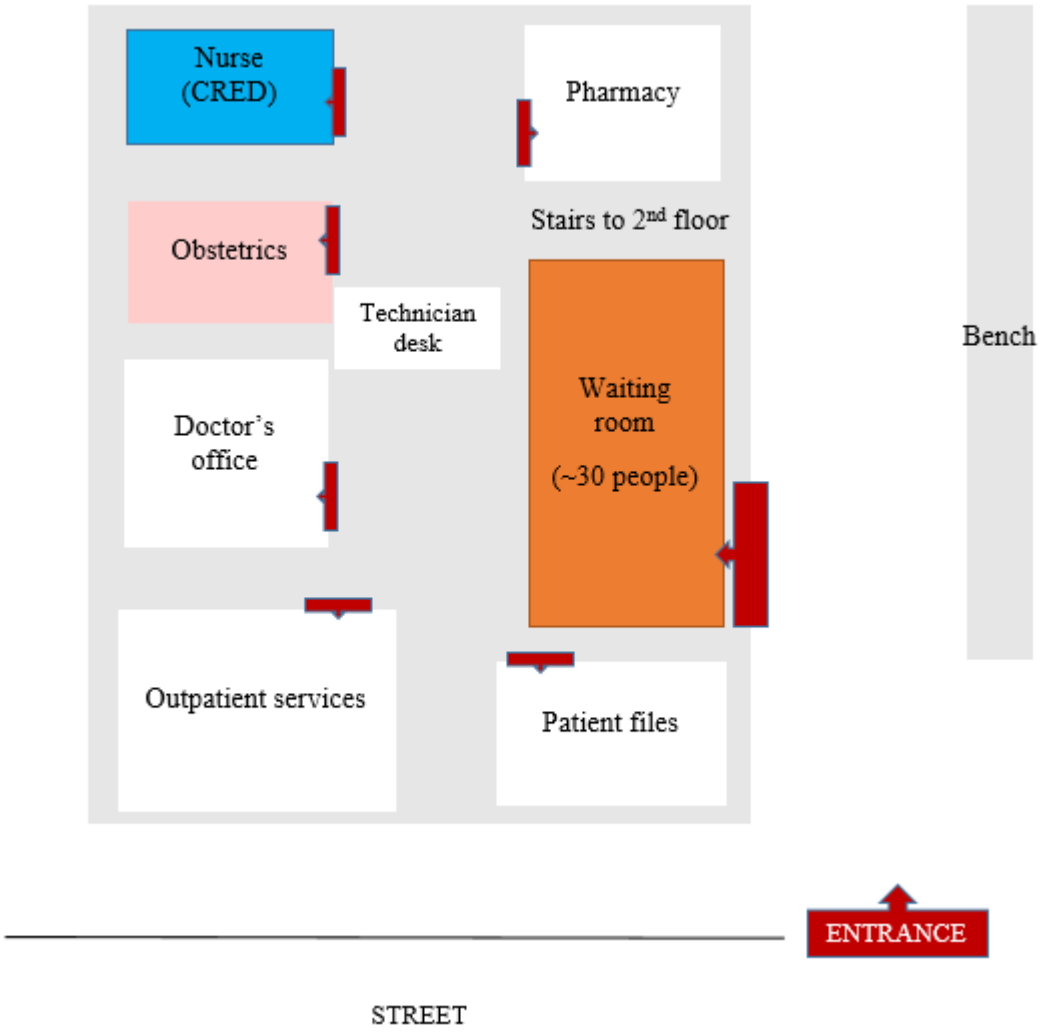
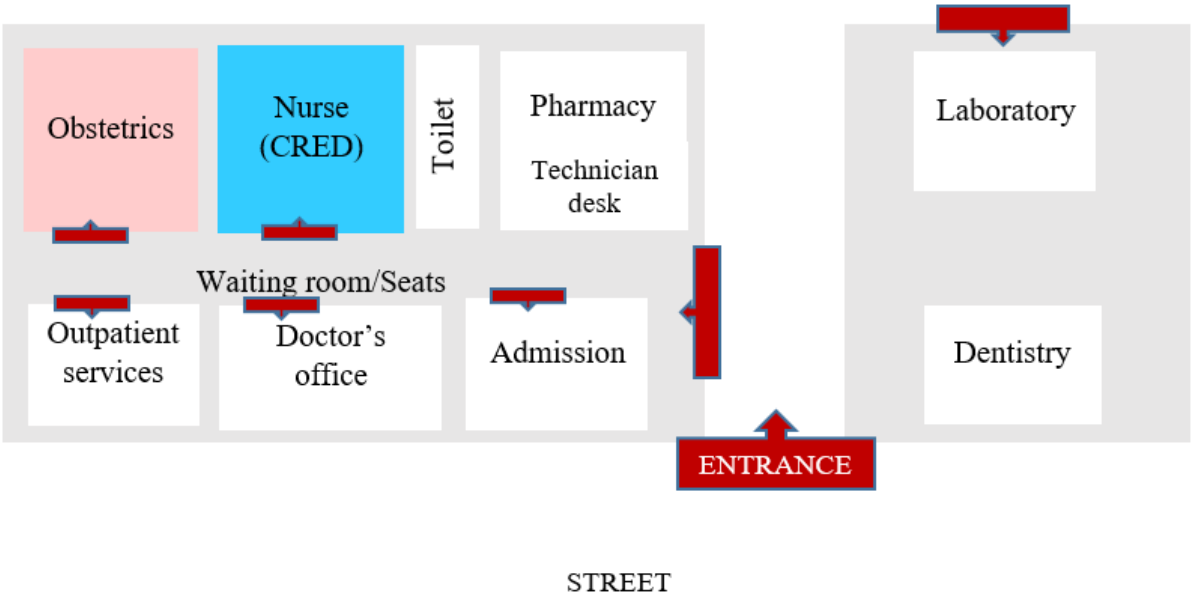


Figure 6.5 Diagram of Health Post of Uyurpampa



8. Discussion

UNICEF's conceptual framework explains malnutrition as being the result of immediate causes (inadequate dietary intake, presence of infections or diseases), underlying causes (poverty, poor water and sanitation, limited access to healthcare, inadequate education), and basic causes (socioeconomic and political context of the society) (UNICEF, 1990). This research project concentrated on underlying causes, specifically caregivers' access to healthcare. The intention of this study was to determine how access to health services (physical access, the types of nutrition services offered and the quality of nutrition education) influenced caregivers' use of the services and their consequent IYCF knowledge and behaviors. This chain of events from the health center to the household is of importance because of how it shapes the care that the child receives in the home. The specific goal of this study was to gain more information on the interactions that occur between HP and caregivers when the latter seek out nutrition information (i.e., nutrition services and CRED) and how these provider-patient contacts play a role in caregiver attendance and compliance to the recommendations. The situation in which this current project occurred is unique in that it was part of a bigger initiative spearheaded by the regional Lambayeque government itself. Recognizing the need for improved nutrition services and wanting to improve the nutritional and health status of children less than five years within their region, the government funded a train-the-trainer initiative where HP of all types (e.g., doctors, nurses, nutritionists, health technicians, obstetricians) were trained in effective nutrition counselling and communication skills including cultural adaptation.

8.1. Significant findings

Results obtained from this research project uncovered different barriers and facilitators to the nutrition education provided within health establishments. At the caregiver level, the mother's Quechua language hindered the proper passage of information between HP and mothers. Place of residence influenced caregivers' practices as foods recommended were not always available to mothers. At the HP level, counselling was found to be more effective when HP made use of didactic materials and communication skills such as asking questions on current practices. The use of materials helped caregivers visualize the information they received and helped them remember nutritional recommendations. Data revealed that communication skills allowed for improved transfer of information. Health professionals' positive attitudes and body language contributed to caregivers' feeling of comfort when attending the health services and influenced

their desire to return to see the HP. Negative attitudes expressed towards caregivers on the other hand had caregivers seeking health services in a different establishment. Nutrition education is multifaceted and recognizing this interplay of different aspects contributes to understanding its complexity. The success of an educational intervention relies not only on HP knowledge, but their capacity to understand their patients and their environment and their ability to incorporate this understanding within their counselling. Counselling skills are pivotal to nutrition education as they play into the translation of information to beneficiaries and their comprehension. In other words, while knowledge is crucial, reaching beyond the theory is even more so to motivate behavior change. Consequently, it is essential that training efforts incorporate both knowledge acquisition and communication skills, in addition to increasing understanding of the context in which the education is or will be provided.

Lastly, at the institutional level, the most important barrier identified was the high frequency of change in personnel of all types including nurses (who work in the CRED program) and nutritionists. The national service program in Peru, as in other countries in the world, was developed to improve the distribution of human resources in health and to better reach rural and peri-urban populations who have more limited access to health services (Mayta-Tristan *et al.*, 2014). Some positive outcomes have been reported such as in South Africa where rural hospitals were said to have improved teams of personnel and shorter wait times for patients (Frehywot *et al.,* 2010). However, while these mandatory services have succeeded in distributing human resources (especially in terms of physicians) more evenly between urban and rural regions, questions remain as to the quality of the care provided in those areas as there is a lack of evidence reported on the effectiveness of having such a system (Mayta-Tristan *et al.*, 2014). Cavender and Alban (1998) brought forth a number of issues identified through interviews, self-administered questionnaires, and observations of physicians completing their service in rural areas of Ecuador. Namely, communication problems arose as rural populations spoke a different language, thereby preventing the physicians from understanding their patients. Rural populations retained cultural practices unfamiliar to the physicians. This was in part due to the physicians not being properly prepared and trained before moving to the rural areas. Overall, where some physicians reportedly felt a sense of satisfaction with having completed their service, others viewed it as a "burden not worth enduring". This has implication for the quality of care that is to be provided by these individuals. This finding also ties in well with a Peruvian study looking at

health staff completing their mandatory service, where it was found that approximately a quarter of *serumistas* screened were considered depressed (Galan-Rodas *et al.*, 2011). As the literature demonstrates, there are several programmatic issues that exist within mandatory services programs, some of which were also identified in this study, and these play in the quality of care delivered to rural and peri-urban populations.

8.2. Limitations

Green and Thorogood (2014) state that "the tension between an etic and an emic perspective is what drives an […] analysis". However, data collection and interpretation may be subjective due to the role of the investigator in gathering information and analyzing it. The first limitation of this study lies in the observations as they are not only difficult to document because they rely on memory, but also because of the potential subjective role of the researcher. For instance, one may observe a consultation and focus on the use of materials as they think it most important, whereas another observer may simply look at the information the HP is giving the mother. In other words, the same observation may yield different interpretations. To ensure that observations had structure and that all pertinent aspects of the consultations were observed (e.g., nutrition messages, use of materials, body language, verbal communication), observation guides were used. Using observations does have its advantages, the first being that they allow to check against what participants are relating to us through other methods such as interviews (Mack *et al.,* 2005). Findings can then be confirmed or contradicted. A second benefit of observations is that they facilitate the gathering of information on the setting surrounding the observational entity, whether that be participants, an event, or an establishment. The setting may include the physical, social, cultural, and economic environment in which the observation is carried out. Lastly, observations allow researchers to get a deeper understanding of the problem at stake or how programs operate and what are some of their barriers and facilitators (Patton, 1990; Mack *et al.,* 2005).

Despite having some limitations, the methodology also was one of the strengths of the study. Where the observations provided information on external behaviors, interviews provided insight into the internal thought process of HP and caregivers on the health services and its operations.

The second limitation had to do with the role of the researcher in the data analysis. The interplay between the researcher's etic and emic perspectives may be as helpful as it can be detrimental to

the interpretation of results and influence what is understood from them. To ensure rigor in the process, two techniques were used. Preliminary results were first shared with key local informants to ascertain data were correctly interpreted. Secondly, triangulation was employed to compare observational data with data obtained from interviews with caregivers and HP.

Finally, the last limitation of this project lay in the time in the field and the uneven distribution of data collection in Mórrope and Incahuasi. While we were able to uncover new information from the data collected in the health post in Incahuasi, the research could have benefitted from more insight from this region as the reality is different from that of Mórrope. The limited data collected was in part due to the fact that during our short period of time in Incahuasi people from the regional government were conducting an audit of the services. This prevented the nurse from attending to patients. Additionally, more time in the field could have allowed us to conduct home visits and in-depth interviews with caregivers.

8.3. Future directions

In the literature, educational interventions have focused on nutrition training and counselling skills and have shown that, in most cases, these help improve caregiver knowledge, IYCF practices, and child growth parameters. However, limited information is available on nutritional education interventions within health services and their association with caregiver attitudes towards nutrition services. The results of this study helped fill this gap and develop a better grasp of the current processes related to nutrition education within governmental health establishments and how these have the potential in influencing caregivers' nutrition knowledge. The insight gained on the nutrition services indicate that future efforts need to be concentrated at three different levels: (1) during counselling sessions, (2) at the institutional level, and (3) at the policy level.

At the consultation level, future programs should work in improving HP attitudes and counselling skills. Negative attitudes may deter caregivers from taking advantage of health services. In addition to negative dispositions, HP are sometimes viewed as authoritative figures within the society, which is a concept that may be both beneficial and detrimental. This notion of power may promote trustworthiness and prompt caregivers to follow HP recommendations. On the other hand, however, it may influence how comfortable caregivers feel when being counselled and dissuade mothers from asking questions and participating during counselling

sessions. Improvement in these areas would not only encourage higher caregiver attendance, but would also benefit interactions between the personnel and beneficiaries. Caregivers would ask more questions or clarifications and HP would have a better understanding of the caregiver's situation, thereby improving the communication that occurs between both parties and increasing caregivers' exposure to nutrition information. This could in turn strengthen the trust that exists between HP and caregivers and encourage compliance to optimal IYCF recommendations.

At the institutional level, several aspects disrupted the continuity of nutrition services. All areas of health services within the establishments had quotas to meet. Nutrition depended primarily on referrals for patients to come and see them to fill the quotas. However, lack of mutual support among the staff led to some HP not referring patients to nutrition. There should be a shift away from quotas and collaboration should be promoted amongst HP so as to increase the number of referrals and patients who seek out nutrition services. Lastly, increasing the monitoring of the health services would help make sure that nutrition activities (e.g., food demonstration sessions) are carried out, as is mandated by the regional government. Coverage of nutrition services would therefore be expanded.

Finally, one of the main issues in relation to the health services in this project was the high personnel turnover. Frequent changes in personnel had implications for both the HP and the caregivers as the system prevented increase in HP expertise and the relationships between professionals and beneficiaries. Additionally, remote populations with limited access to primary healthcare did not have access to a nutritionist, leaving the task of nutrition counselling to the nurse. Consequently, health services would benefit from having nutrition education harmonized within the curriculum of HP of all types. Health professionals would enter the workforce with basic knowledge of nutrition and optimal practices for caregivers to adopt.

The trainings provided as part of the train-the-trainer project seemed to improve counselling as some of the materials developed through the initiative were used and key messages disseminated to caregivers. The train-the-trainer initiative trains permanent staff with the requirement that they pass on the training to the rest of the HP within their health establishment. However, not all of the personnel reported having received nutrition education training. This may be due to the personnel interviewed being new and not having received the training by the time of data

collection. Nevertheless, further research is needed to determine whether the trainings are sufficient to improve the delivery of nutrition information in these districts.

From what was learned in this study, future programs wishing to make use of a health service-based educational approach need to take into account the dynamics of the services and the relationships between professionals and beneficiaries. Current levels of child malnutrition demonstrate that it is insufficient to educate HP and caregivers without addressing issues of communication between both.

Future policies should take into account that national services and the high personnel turnover is detrimental to nutrition information dissemination as it inhibits the continuity of nutrition services. In order to improve the nutrition education at the health service level, the Ministry of Health should consider providing formal nutrition training to all HP working within governmental health establishments. As permanent health staff in rural and peri-urban health centers are normally of lower level positions (e.g., technicians), it is important that these permanent HP be able to provide a higher quality nutrition education to caregivers. At the global scale, similar environments in the world using or thinking of implementing education interventions benefit from this study through an increased awareness of barriers and facilitators to this approach. It is important to understand the dynamics within health establishments providing primary health care and how they influence the quality of the various services, including nutrition counselling, and caregiver's attendance and compliance to healthy practices.

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Appendices

Appendix I. Categorization of health establishments

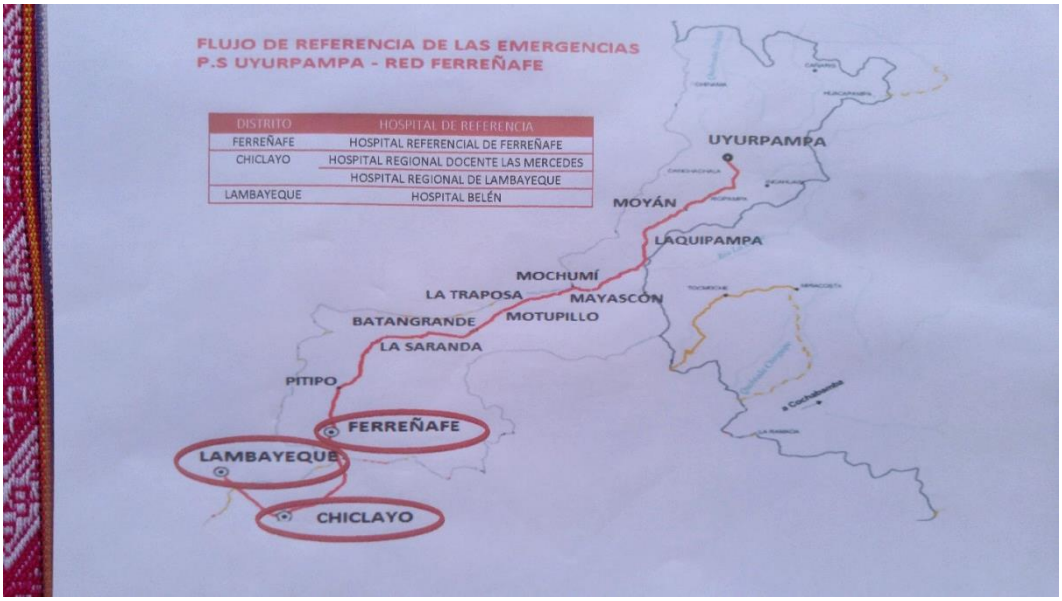
Categorization of health establishments is according to the level of care and complexity of the services provided.

Level of care	Complexity level	Categories of health establishments	
Primary	1° level of complexity	I-1	Health Posts
	2° level of complexity	I-2	
	3° level of complexity	I-3	Health Centers
	4° level of complexity	I-4	
Secondary	5° level of complexity	II-1	Hospitals
	6° level of complexity	II-2	
Tertiary	7° level of complexity	III-1	
	8° level of complexity	III-2	Specialized institutions

Appendix II. Maps of the study sites

Appendix II-a. Districts of Mórrope and Incahuasi in relation to capital, Chiclayo

Appendix II-b. Map of the way from Chiclayo to Uyurpampa



Appendix III. Summary of data collection activities

Method / Participants	Direct observations	Exit-interviews	Home observations	In-depth interviews
Caregivers	28 counselling sessions 2 demonstrations	21 – Mórrope 4 – Incahuasi	5 – Mórrope	6 interviews
Health professionals				5 interviews

Appendix IV. Data collection tools

Appendix IV-a. Observation guide for CRED counselling sessions

Direct Observation Guide

Project: "Breaking down the barriers – improving nutrition and health counseling services to facilitate behavior change in disadvantaged areas of Lambayeque, Peru"

Mapping of community

- Establishments making up the community: schools, churches, health establishments (health center, health posts, EsSalud, clinics)

The Health Center

- Where is the health center in the community?
- When is the center opened? (Weekdays vs weekdays and weekends, hours opened)
- What are the hours at which the center is open and offering services to caregivers?
- How many people attend the health center? Who attends the health center (mothers and children, adults, seniors?)
- Mapping/setting of the health center – waiting room, consult room, activities and services offered
- Atmosphere of the health center + look of the health center
- Privacy of sessions and consults or lack thereof

The Health Personnel and the Consult

- Observe attitude of HP with people entering health center
    - How are the services organized: do mothers have to take a number or take an appointment and come back later? Can they sign in and wait for their turn? If they wait, how long is their wait time?
- Consult:
    - Interaction time with the mother (and child)
    - Patient load during the consult: is it a one-on-one consult or are there more than one mother/patient? If so, how much time is spent with each person?
    - Setting of consult room (chairs/desks, how close are the chairs and mothers to didactic material, if present)
    - What messages are given and in what order?
- Attitude of HP in consultations
    - Introduction: how do they introduce themselves to the mother, how do they start the session

    - How do they interact with the mother (language (formal vs informal) and body language: eye contact, gesticulations)? How do they address the caregiver, by her name? What about her child?
    - Do they use didactical materials to explain recommendations to mothers? If so, what is used and what is available?
    - How do they interact with the child, if he/she is present?
    - Openness to questions or comments from mothers
    - Do they encourage the mother to ask questions or ensure they understand the messages?
    - Are they able to respond to the caregiver's questions?

- Factors that seem to facilitate or seem to be a barrier to counselling (especially in terms of traditions, beliefs, taboos)
- How does the HP end the session (e.g. does he/she encourage the mother to come back with her child)?

<u>The Mothers</u>

- Attitude of mothers in consult
    - Introduction – how do they respond to the presentation of the HP?
    - How do they act during the consult? Do they ask questions or clarifications?
    - Is the interaction consistent throughout the consult – do they express more interest at the beginning of or towards the end of the consult? Or does the interest seem to be linked to the level of importance of recommendations?
    - Pay attention to language used (e.g. *usted* vs *tu*), and body language
    - Are they open to the messages and recommendations?

Appendix IV-b. Exit-interview questionnaire for caregivers

Mothers Exit Interviews Questionnaire

Project: "Breaking down the barriers – improving nutrition and health counseling services to facilitate behavior change in disadvantaged areas of Lambayeque, Peru"

I confirm that the study was explained to the mother and that the mother has given her consent in participating in this interview.

☐ Yes ☐ No

Name: _____ Date: _____

- Mother's age: _____
- Relationship with child: _____
- Number of children: _____
- Child's age (years): _____
- Name of child: _____
- Date of birth of child: _____
- Village of residence: _____
- When did she start attending the health center with her child? _____
- Why did she start attending the health center/what incited her to attend the health center?: _____

Questions on their general experience in the health establishment

- What services have you visited today in the health center/health post?
- In any of those services, did you receive any advice in regard to your child? Did they give you any advice on your child's nutrition?
- How were the messages provided to you? (Explanations vs use of materials, images, charts, posters, model plates)/Please tell me what the health worker was doing during the consult?
- Did you talk during the consult; did you ask questions or have any doubts regarding something the health worker said?
- Did the health worker ask you what you are currently giving your child at home?

Questions on their opinions of the counselling

- What message(s) was most important to you and your child? Why?
- Were there any other messages or indications given to you?

- Which of the things the health worker told you can you do at home? Which messages would you be able to carry out in your home? Why?
- Which of the things the health worker told you can you not do at home? Which message(s) do you think you would not be able to do in your home? Why?
- Do you believe the messages that you received will help you care for your child? Why?
- Were there any other subject or theme you would have liked to discuss with the health worker?

<u>Questions on their impression of the health worker and the counselling session</u>

- How did you feel during the counselling session? Would you like to come back to see the health worker?
    - Did you have any more questions or doubts?
    - Did the health worker make you feel comfortable during the counselling session?
    - Did the health worker use words and expressions you understood or would you have preferred they explain differently?

Appendix IV-c. In-depth interview questionnaire for caregivers

Questionnaire for In-depth interviews with mothers

Project: "Breaking down the barriers – improving nutrition and health counseling services to facilitate behavior change in disadvantaged areas of Lambayeque, Peru"

I declare that the study was explained to the caregiver and that the caregiver gave their consent to participate in this interview. *Make sure consent form has been signed.*

Did the caregiver accept that the interview be recorded? *Indicate on separate interview list.*

- Mother's age: _____
- Relationship with child: _____
- Number of children: _____
- Child's age (years): _____
- Child's name: _____
- Date of birth of the child: _____
- Village, district of residence: _____
- What health establishment do you attend? _____
    - If different than the village health establishment that the caregiver lives in, what is the reason for going to this different health center/post?
- When was the first time the caregiver brought her child to the establishment? _____
- Why did she start attending the health center? What incited her to attend the health center? _____

<u>Health centers and their purpose</u>

- Why do you bring your child to the health center/post? What do you expect to find in the health center/post?
    - Prevention/curative services, information, social reasons (talk with other caregivers), CRED, etc.
- What are the aspects make you think/see that your child is healthy?
    - Physical aspects (weight, height) or their nutrition, consumption of food, quality or quantity of the food they eat, how you see him develop/grow
- Why is it good for you to go to the health center/post?
    - In relation to yourself: Do you see benefits for yourself?
    - In relation to your child: Are there benefits for your child?
- What type of sessions or activities do you normally attend in the health center?

- Do you learn new things when you go to the health center? If yes, what do you learn? How does this information help you?
- Is learning about nutrition for your child important for you? Why?

Child's care and feeding recommendations

- What challenges or problems do you face in terms of your child's nutrition?
- What messages do you remember receiving for your child from the health personnel in the health center? (Go through each message one by one)
    - What does this message mean to you?
    - What do you think of that message? (Is it feasible for you?)
    - Do you think other family members, neighbors, friends could do that? Why or why not?
    - Are there any taboos or traditions that do not agree with the recommendations given in the health center?
- Do you share messages with other members of your family or other mothers? If so, which message do you share? Who do you share them with?

Experience surrounding the health centers

- How do you feel when you attend the health services in the health center/post?
- How do you feel when interacting with the health personnel?
    - Do you ask questions or explanations? Do you talk with the health personnel?
- Do you think the health personnel understand your everyday life and the traditions that exist in your community? Do they ask questions about what you do in your household?
    - Reality means the knowledge that caregivers have, the resources that are accessible, traditions and beliefs that exist, restrictions that caregivers face everyday
- Do you understand what the health personnel says during the consult? Do you feel the health personnel was able to properly explain the information to you/knew the information properly?
    - Do you think the health personnel was knowledgeable and well prepared?
- In what form do you prefer the information be given to you (demonstrations, charts, images, only discussions)? How should the information be presented for you to understand it better?
- When attending the health centers, are you satisfied with the information given to you? Do you think the information is sufficient to help you care for your child?
- Do you believe you are able to carry out the recommendations of the health worker considering what is available to you in your household and your beliefs and traditions?
- Are there other services you wish would be available to you in the health center/post? Which ones?

Appendix IV-d. In-depth interview questionnaire for health professionals

Health Personnel Interview Questionnaire

Project: "Breaking down the barriers – improving nutrition and health counseling services to facilitate behavior change in disadvantaged areas of Lambayeque, Peru"

- Name:_____
- Age: _____
- Position/role held in the health center: _____
- Time of experience in this particular position: _____
- Length of time the health worker has held that position in this health center: _____
    - If the health worker has had a long history with the center, what positions has he/she held over time?_____
    - Where else have you worked?
- Area of residence: _____

- What is your role as a health professional in regard to nutrition education and caregivers?
- What types of activities (in child nutrition) have you been a part of/conducted (Demonstration sessions, medical campaigns, health fairs, counselling)?
    - What is the purpose of those activities? What outcomes are expected from carrying out these activities?

- Have you received any type of training during your time in the health center/post?
    - If yes, have you observed changes before and after the training in how you give information to caregivers or in how your colleagues give information?
- Which activity do you find most useful to give child nutrition information to caregivers? Which activity do you think allows mothers to understand better?
- Which activity or recommendations seem most accepted by caregivers?
    - Which activity helps most in making mothers adopt the recommended practices?
- Can you recount a successful or less successful experience which you have had during your time in the health center/post?
- Are there any traditions or beliefs that affects how caregivers put the recommendations in practice in their household?
- What are some factors or aspects which seem to facilitate nutrition education?
    - In terms of personnel, supply, organization of activities, community, attendance or lack thereof, messages given, education level of the caregivers or family members etc.
- What are some barriers to the nutrition education that you provide to caregivers?

    - Institutional (attendance, time constraints, etc.) vs.
    - Barriers of the personnel (material comprehension, skills, training sessions, etc.)

- What do you feel you have accomplished in your time in the health center/post?
- What sort of adjustments would be needed to help make these activities more successful in educating mothers?
    - Modify type of activity, change the information that is given, or how the information is given, etc.
- Do you think the adjustments you mentioned would be feasible to carry out in the near future?
    - What would be the barriers (institutional and personal (skills)) that could get in the way of accomplishing these changes?
    - How would you accomplish those changes?