

“We give her meat because we have the ‘*molinito*’”: A snapshot of the “*molinito*” household trials

Introduction

Despite a reduction in malnutrition in Peru over the past few decades, malnutrition remains prevalent in some areas of the country. Increasing infants’ and toddlers’ consumption of animal-source foods improves their growth and development, and is seen as a significant method of combating malnutrition. The Institute of Nutritional Research (IIN) based in Lima, Peru explored a method of reducing child malnutrition by addressing the consumption of animal-source foods in two districts in Northern Peru, Morrope and Incahuasi. Anthropologists conducted formative research in these areas to explore some of the underlying causes of malnutrition. Through this research, the IIN learned that some of the potential contributing factors to malnutrition are ethnotheories that the consistencies of animal-source foods are not appropriate for young children for fear of that they would cause choking or stomach problems (Bartolini et al 11). Researchers then carried out a pilot study to assess whether a manual food grinder that changes the consistency of animal-source foods has the potential to facilitate caregivers’ providing of more animal-source foods to their children ages 6 to 18 months. An overview of child malnutrition globally and in the region of Incahuasi, a discussion of the importance of animal-source foods in reducing malnutrition, and a summary of the methodology and preliminary results of the grinder household trials conducted in Incahuasi are discussed below.

Causes and effects of child malnutrition

Despite a decrease in wasting, stunting, and micronutrient deficiencies globally over the past twenty years among children less than five years old, child

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malnutrition continues to be a prevalent problem, especially in South Asia and Sub-Saharan Africa (Black et al 427). In 2011, stunting affected an estimated 165 million children younger than five and wasting affected at least 52 million children worldwide (Black et al 427). According to Black et al, child undernutrition is the cause of 3.1 million deaths worldwide (427). Iron deficiency, which negatively impacts child development, is prevalent among children. An estimated 18.1% of children worldwide have anemia due to inadequate iron consumption and 1.5% of children suffer from severe anemia (Black et al 439). Many countries are also experiencing the double burden of malnutrition, which includes both obesity and malnutrition. Child malnutrition is a major public health concern because it increases children’s risk for morbidity and mortality and negatively impacts their cognitive, social, and motor development, harmfully affecting their school performance and economic productivity (Black et al 382). Suboptimal growth also increases children’s risk of dying from infectious diseases during childhood (Black et al 382).

The first 1000 days after conception is the time period in a human’s life that has the greatest impact on a child’s nutritional status (Black et al 434). An array of factors contributes to child malnutrition, including but not limited to, inadequate nutrition during infancy and childhood, food insecurity, maternal nutritional status, maternal education, infectious diseases during early childhood, and fetal growth restriction (Black et al 434). Maternal stunting increases children’s risk of being preterm or term small for gestational age (SGA) (Black et al 433). Diarrhea is the infectious disease that most affects linear growth among children (Black et al 434).

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Addressing child malnutrition

A variety of interventions have been employed to attempt to curb rates of child malnutrition. Interventions address different factors associated with malnutrition, including optimizing the health of mothers before, during, and after pregnancy, improving complementary feeding practices of infants, distributing ready-to-use therapeutic foods to treat acute malnutrition, promoting exclusive breastfeeding, fortifying staple foods, preventing and treating infectious disease, and carrying out micronutrient supplementation programs for pregnant women, mothers, and children (Bhutta et al 453). Maternal micronutrient supplementation during pregnancy has been shown to reduce low birth weight and SGA births by 11 to 13 percent (Bhutta et al 455). Energy and protein supplementation of pregnant malnourished and/or food insecure women has been shown to reduce the incidence of SGA by 32% and risk of stillbirths by 45% (Bhutta et al 456). Other child malnutrition interventions address complementary feeding practices, which advocate the introduction of safe, nutrient-dense, and varied foods at six months of age (Bhutta et al 458). Evidence suggests that there is an association between dietary diversity during complementary feeding and reduced risk of stunting and underweight of children (Bhutta et al 458). The World Health Organization’s “Guiding Principles for Complementary Feeding of the Breastfed Child” include guidelines that address topics including but not limited to responsive feeding, food consistency, and nutrient content of complementary foods. According to the guideline addressing the nutrient content of complementary foods, “Meat, poultry, fish or eggs should be eaten daily, or as often as possible” (Dewey 22). Animal-source foods are especially important due to their iron, zinc, and B12

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content, which are important for child development. Providing infants exclusively with plant-based complementary foods is not sufficient to meet their micronutrient requirements (Dewey 23).

The Importance of animal-source foods for children

Animal-source foods are rich in micro and macronutrients necessary for human growth and development, including B12, iron, vitamin A, zinc, and iodine (Dror and Allen 227). Vitamin B12, which is essential in folate metabolism and cognitive development, is only found in animal-source foods (Higdon). Iron is essential for growth, development, healthy cell functioning, and synthesis of a variety of hormones and connective tissue (NIH). Low consumption of foods high in heme iron (poultry, fish, and meat) is presumed to be the cause of 50% of anemia cases in the world (Dror and Allen 227). Iron deficiency in infants can lead to damaging cognitive and psychological effects, including delayed attention and social isolation (Iron). Vitamin A is important for production and function of white blood cells, maintenance of the health of endothelial cells, and vision (Vitamin A). Zinc is important for immune function, protein synthesis, wound healing, cell division, and DNA synthesis. Zinc deficiency can lead to growth retardation and diminished immune function (Zinc). Iodine is essential for thyroid function, which regulates metabolism. Furthermore, it is important in the skeletal and central nervous system development of infants (Iodine).

Complementary feeding intervention in Peru

Despite an overall improvement in child malnutrition in Peru, it continues to be a prevalent problem, especially in rural areas. Nutrition studies of young children in Peru carried out by the IIN and other institutions found that infants are not consuming

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enough animal-source foods (Creed et al 3987S). Furthermore, children are commonly deficient in zinc, iron, and vitamin B12. Although lack of resources and access contributes to young children not eating an adequate amount of animal-source foods, ethnotheories surrounding the dangers of the consistency of animal-source foods is oftentimes a barrier to providing these foods to young children in many areas in Peru.

Due to the high prevalence of child malnutrition in Lambayeque, a region in Northern Peru, a team of nutrition investigators from the IIN and the University of North Carolina, Chapel Hill designed and carried out a pilot study addressing complementary feeding practices in the region. The objective of the study was to explore whether the use of food grinders, or “*molinitos*,” to change of the consistency of complementary foods would improve the acceptability of feeding foods of animal origin to children ages 6 to 18 months. “*Molinitos*” are small plastic grinders with stainless steel cutting blades. Food is placed in the plastic cavity below the cutting blades, and the food is ground by a person rotating the handle. This pilot study, funded by the Mathile Institute for Advancement of Human Nutrition, will be discussed in further detail below.

Lambayeque and the reality of child malnutrition

The Lambayeque region is comprised of the Pacific Coast, desert, dry forest, the Andes Mountains, and home to the largest city in the region, Chiclayo. The diversity of terrain brings with it a range of agriculture and food availability. Closer to the coast, there is a wide variety and accessibility of fish and a vast diversity of fruits and vegetables. Further up in the mountains, eggs, guinea pig, and chicken are the

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most common animal-source foods consumed and there is less variety of produce (Bartolini et al 18). Peas and several types of potatoes are the most commonly cultivated produce in the higher elevations of the province.

Despite the prevalence of agricultural production in Lambayeque, there are high rates of child malnutrition throughout the region. The provincial government has called attention to the high rates of child malnutrition in parts of the province, and instituted programs to help curb this problem. The prevalence of malnutrition among children less than five years old in Lambayeque is between 28 and 54%, and the rate of anemia in the province is between 70 to 80% (GERESA). Access to animal-source foods and ethnotheories regarding appropriate complementary feeding practices contribute to the nutritional statuses of young children in Lambayeque. Formative research carried out by anthropologists and other researchers at the IIN explored these ethnotheories. A common conception found among caregivers of children younger than two is that animal-source foods, primarily meats, are not appropriate for young children because they can easily choke on these foods and cannot easily digest them (Bartolini et al 11). Animal-source foods with a softer consistency, such as egg and chicken liver, tended to be more acceptable for children under one-year-old. If meats were available, they tended to be introduced later to children due to the fear that children would choke or have difficulty digesting them.

Map of Peru with Lambayeque Region Indicated by Arrow

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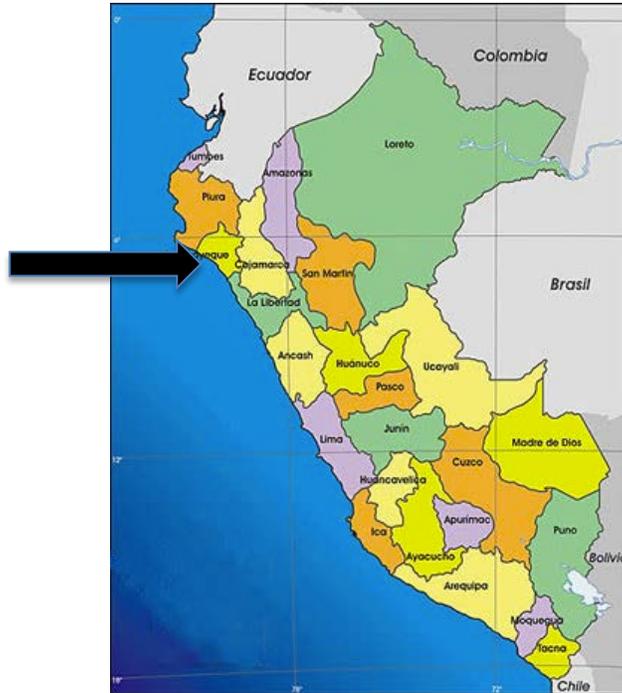


Figure 1. Pliegos Tarifarios Aplicables a Usuarios Finales de Electricidad; Organismo Supervisor de Inversión en Energía y minería

The Nutritional landscape of Incahuasi

Phase 1 of the pilot study explored the nutritional practices of residents of Incahuasi, including complementary feeding practices. In Incahuasi, a Quechua-speaking district in Northeastern Lambayeque, the prevalence of child malnutrition is 54%, the highest in the province (Bartolini et al 9). Furthermore, Incahuasi has little diversity of foods, including animal-source foods. The most commonly consumed animal-source foods among children younger than two are eggs. Guinea pig and chicken are commonly consumed among some households, but often delayed in feeding to children due to fears about their consistency. In the 15, 24-hour recalls conducted by the research team of the IIN in Incahuasi, only 27% of caregivers of children between 6 and 24 months gave their children some animal product (beef, fish poultry, eggs, or viscera) the day prior to the recall (Bartolini et al 39). Furthermore, only 7% of children consumed all four food groups (meat, dairy,

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vegetables, and fruit) the day prior to the recall (Bartolini et al 39). The observations, interviews, and 24-hour recall revealed that thin soups were the typical foods provided to young children.

The lack of diversity of animal source foods coupled with cultural beliefs about the danger of providing meat to children younger than two years contribute to the high rate of child malnutrition in the district. Due to the high rates of child malnutrition and predominance of fears about the consistency of animal-source foods in Incahuasi, this district was selected as one of two sites to carry out the pilot household trials of a nutrition intervention study. The town of Uyrupampa in Incahuasi was selected as a site to deliver the intervention because its relatively large population facilitated the recruitment of 15 mothers with children between 6 and 18 months. Uyrupampa’s overall acceptance of the “*molinito*” demonstrated during focus groups and its prevalence of Spanish-speakers factored into the site selection as well. The study examines the effectiveness of “*molinitos*,” or “little grinders” in Spanish, in increasing the frequency that animal-source foods and thicker-consistency foods are offered to children ages six to eighteen months by altering the consistency of these foods to a more desirable texture. Since one of the major barriers to providing animal-source foods to young children in Incahuasi appeared to be the fear over the consistency of the foods, an intervention was selected that would change the consistency of foods to a smoother and more acceptable one.

Map of Lambayeque region and Incahuasi District

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Figure 2: Mapa de vulnerabilidad a la desnutrición crónica infantil desde la perspectiva de la pobreza, 2010, World Food Program

The Methodology of the “*molinitos*” household trials

Prior to starting the household trials to assess the effectiveness of the “*molinitos*”, focus groups were conducted in two towns in Incahuasi to assess the acceptability of the “*molinitos*” among caregivers of children less than eighteen months. Furthermore, interviews and household observations were conducted to gain a deeper understanding of the feeding practices of caregivers of young children. Once the evidence suggested the “*molinitos*” gained acceptance and many focus group participants began to believe that the “*molinitos*” would be useful in feeding their children, the research team began developing methodology for household trials.

The research team determined the components of the household trial interventions and protocol for each visit. The intervention focused on three feeding practices: providing thicker-consistency foods, increasing the frequency and variety

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of animal-source foods, and providing multimicronutrient (MMN) supplements to the participants’ children. Because researchers had found in their formative research that caregivers tended to provide soups to children containing mostly broth, the research team decided to use the “*molinito*” as a facilitator for preparing thicker, more nutrient-dense foods. Due to the low frequency at which caregivers provided animal-source foods to their children in Incahuasi, researchers also chose to introduce the “*molinito*” as a way of increasing the acceptability of caregivers to provide their children with animal-source foods. Finally, because the regional government of Lambayeque was concurrently carrying out an initiative to provide children under the age of three with MMN, reinforcement of their importance and correct preparation was chosen as the third nutrition practice of the intervention.

Prior to carrying out the intervention, each participant’s existing stage of carrying out the three nutritional practices had to be determined. It was necessary to determine the consistency at which she prepared her child’s food, the frequency at which she provided her child with animal-source foods, and whether and how she provided MMN to her child. The researcher asked each participant to prepare food for her child with the soup provided at the visit to determine the consistency of food she prepared for her child. A food frequency questionnaire was carried out to determine the frequency at which animal-source foods were provided and whether MMN were provided. If the participant provided MMN to her child, she was asked to demonstrate how she prepared it. Once the stage of the participant was determined, the researcher tailored the intervention according to the participant’s nutritional practices.

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Phases of the “*Molinitos*” Pilot Study:

1. **Formative research:**
 - a. 6 focus groups with mothers of children 6 to 18 months of age in Incahuasi and Morrope
 - b. 20 in-depth interviews and home observations of mothers with children 6 to 18 months of age in Incahuasi and Morrope
2. **Creation of research methodology based on formative research**
 - a. Determined the feeding practices to address in the intervention
 - b. Designed the protocol for each visit
 - c. Created materials needed for the intervention
3. **Recruitment of participants**
4. **Household trial visits/data collection**
5. **Data Analysis**

The Structure of the household trial visits

The household trial intervention consisted of five visits. During the first visit, a 24-hour recall and food frequency questionnaire were carried out to establish the stage of the participant to help customize the intervention. The second visit began with the researcher asking the participant’s hopes and vision for her child’s future in order to link these aspirations with the “*molinito*” and the three nutrition practices of the intervention. Common hopes expressed by participants for their children included being a good student, being healthy, being a professional, and growing well. The participant also demonstrated how she typically prepared food for her child so the researcher could determine the consistency of food the caregiver usually prepared for her child. The participant was then introduced to the “*molinito*” as a method of preparing food to help her child achieve these goals. The participant practiced preparing food in the “*molinito*” and cleaning it. The second visit’s focus was on the nutrition practice of preparing foods thicker than soups due to their higher nutrient

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density. The “*molinito*” was introduced as a method of easily preparing thicker foods, and the researcher and participant established an agreement on the consistency of the food she would try to prepare for her child in the coming days.

The nutrition practice introduced in the third visit was increasing the frequency at which she provided animal-source foods to her child. The researcher also assessed how the participant carried out the practice of providing thicker foods to her child by asking her to prepare food in her “*molinito*” as she had been preparing it over the past few days. The researcher then used pictures of different animal-source foods to facilitate a conversation with the participant about which foods she offers to her child and which ones she believed weren’t appropriate for her child at his or her current age. The researcher then explored the caregiver’s barriers in providing some of the animal-source foods shown on the cards, and discussed the importance of animal-source foods in the growth and development of her child. The “*molinito*” was then introduced as a method of providing animal-source foods to young children, and the participant practiced grinding meat in her “*molinito*.” Finally, the participant determined the frequency at which she would try to provide animal-source foods prepared in her “*molinito*” to her child in the coming week.

The fourth visit consisted of assessing the frequency at which the participant provided animal-source foods to her child over the past week. The final nutritional practice of the intervention, the use of MMN, was also introduced. If the participant reported providing MMN to her child in the initial food frequency questionnaire, the researcher would ask her to prepare MMN as she normally would for her child. If necessary, researchers corrected any issues in the participant’s preparation method.

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The researcher then introduced the “*molinito*” as a way of preparing MMN, since the correct preparation method is to mix MMN in thick-consistency foods. If the participant had not received MMN or was not providing them to her child, the researcher demonstrated the appropriate preparation method and the participant practiced how to prepare MMN. An important component of the visit was explaining the contents of the MMN and how they contribute to the growth and development of children, while also underscoring that MMNs do not replace food. The importance of animal-source foods was also reinforced during this visit.

The fifth and final visit of the intervention consisted of a final 24-hour recall and food frequency questionnaire. The researcher also followed up with the caregiver on whether and how she provided MMN to her child in the previous few days by asking her to prepare MMN with food provided during the visit. Finally, the researcher carried out an evaluation of the three nutritional practices introduced or reinforced during the intervention. During one part of the evaluation, the researcher asked the participant to prepare food in her “*molinito*” as she did during the past few weeks of the intervention to assess the consistency of foods she provided to her child. Other questions of the final interview included whether the participant knew someone in the community who would be able and willing to teach others about the “*molinito*” and who the participant would give her “*molinito*” to once her child no longer needed it. A follow-up visit at least one month after the fifth visit is planned with each participant in order to determine whether the caregivers are still using the “*molinitos*” after the conclusion of the intervention.

Chronology of Household Trial Visits

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Visit 1	<ul style="list-style-type: none"> • 24-hr recall • Food Frequency Questionnaire
Visit 2	<ul style="list-style-type: none"> • Introduction of how to use and clean the “<i>molinito</i>” (the participant receives the “<i>molinito</i>”) • Discussion of the importance of providing thick-consistency foods
Visit 3	<ul style="list-style-type: none"> • Discussion of the importance of providing animal-source foods • Practicing preparing animal-source foods in the “<i>molinito</i>”
Visit 4	<ul style="list-style-type: none"> • Discussion of the importance of MMN • Practicing preparing MMN
Visit 5	<ul style="list-style-type: none"> • Final 24-hour recall • Final Food Frequency Questionnaire • Final evaluation of all three nutrition practices

Preliminary results of the household trials

Participants

A total of 15 caregivers participated in the first and second rounds of household trials in Uyurpampa, Incahuasi. They included 14 mothers and one grandmother of children ages six to 21 months. Although the target age range of participants’ children was six to eighteen months, there were two participants whose children were 19 and 21 months. Eight of the participants were first-time mothers, while six mothers had more than one child (this is excluding the participant who was the primary caregiver for her granddaughter). Three caregivers participated in the focus groups about the “*molinitos*” and one caregiver participated in the in-depth interview at which time she received the “*molinito*,” but had not been introduced to the three nutrition practices of the intervention. Two of the fifteen total participants did not complete all five visits of the intervention. One participant stated she did not have time to continue participating, and stopped after the third visit. Another participant only completed the first three visits because she traveled away from the

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area. However, a researcher will finish the intervention with this participant when she returns to the field.

Nutrition Practice 1: Providing thicker-consistency foods

A prevailing theme linking participants’ perceptions of the “*molinito*” was its usefulness in preparing food for their children. Prior to participating in the intervention, eleven out of fifteen participants prepared food for their children in a watery consistency with mostly broth. However, at the end of the intervention, all eleven participants prepared a thicker consistency of food for their children than they did prior to the intervention. Two participants expressed fear about providing thicker foods to their children at the beginning of the intervention. One participant said she worried that “*thick foods would harm her little stomach,*” referring to her daughter’s stomach [mother of 8-month-old infant]. However, they did not express this fear at the end of the intervention. The “*molinito*” facilitated the preparation of thicker foods for participants’ children.

Nutrition Practice 2: Providing animal-source foods

Among most participants, the “*molinito*” facilitated the introduction of meats or an increase in the frequency and variety of animal-source foods caregivers provided to their children. Ten of the thirteen women who completed the intervention provided either a greater frequency or more variety of animal-source foods to their children when comparing the initial food frequency questionnaire to the final one. Many women stated that they could now provide foods to their children that they could not give them prior to receiving the “*molinito*.” One participant said she was now able to give apples to her child because of the “*molinito*.” Another participant said the

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“*molinito*” enabled her to provide meat, including chicken, beef, and pork, to her granddaughter. Prior to receiving the “*molinito*,” the only animal-source products the participant provided to her granddaughter were egg, milk, cheese, and yogurt. Two participants who had been providing a relatively varied and high frequency of animal-source foods to their children at baseline did not change the frequency or variety of animal-source foods provided to their children at the end of the intervention. One participant who gave relatively few animal-source foods to her child at baseline did not increase the frequency or variety of animal-source foods to her child at the end of the intervention. One reason for this lack of change in providing animal-source foods is her family’s lack of resources. She said her family typically ate animal-source foods once per week because they didn’t have the means to purchase it more frequently. Although many families raised their own animals, these were often sold rather than consumed by the family. The availability of meats to purchase was often limited. One caregiver remarked, “*there is a man who sells it [meat] every day, but sometimes there isn’t meat*” [grandmother of 18-month-old infant]. Another participant said she had not provided meat to her child that week because “*the man hasn’t killed anything, because of this I haven’t bought it*” [mother of 15-month-old infant]. The limited availability of animal-source foods, primarily meat, proved to be a barrier in Uyurpampa for caregivers to provide more variety and a higher frequency of meats to their children.

Nutrition Practice 3: Providing MMN

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The final nutrition practice of the intervention, providing MMN, was reported to be practiced daily by ten of the fifteen participants according to the baseline food frequency questionnaires. However, the food frequency questionnaires were contradicted by most of the baseline and post-intervention 24-hour recalls, which do not contain MMN. The “*molinitos*” appeared to facilitate the practice of preparing MMN by enabling caregivers to more easily prepare thick-consistency foods. Although caregivers learned how to properly prepare MMN and the “*molinitos*” facilitated the correct preparation method, two caregivers reported their children refused to eat MMN due to their strong flavor. One participant said, “*He throws it away. He doesn’t want it. He is already scared. When I open the MMN he leaves the kitchen. He knows, and he doesn’t want it*” [mother of 8-month-old infant]. Demonstrating the correct preparation method and having participants practice this method was a key component of the intervention. Out of the ten participants who reported providing MMN daily to their children, only two participants demonstrated the correct MMN preparation method at baseline. It was clear that there is little to no instruction from the health clinic that distributes the MMN on how to properly prepare MMN.

Case Studies of Participants

At baseline, participants ranged from providing thick-consistency and animal-source foods on a regular basis to providing watery preparations and very little animal-source foods to their children. Participants’ personal beliefs over providing thicker and animal-source foods to young children and their access to animal-source foods influenced their nutrition practices. Two participants, whose names have been

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changed to maintain their confidentiality, demonstrated distinctive responses to the intervention. Ana, the primary caregiver of her fifteen-month-old granddaughter and Katerina, the mother of a fifteen-month-old girl, are discussed below.

Case Study: Ana

Ana and her granddaughter live alone in Uyurpampa in a modest one-story adobe house. Ana is a religious woman who attends church daily and works with the nuns of Uyurpampa. Ana’s granddaughter Melba is a chubby-faced and cheerful toddler. Melba’s mother asked Ana to take care of her because she is studying at a university about five hours from Incahuasi. Although Ana does not have many resources aside from her cow and oftentimes expressed anxiety over not being able to provide for Ana, she does her best to provide for her granddaughter.

Ana said Melba constantly has stomach issues, including diarrhea and vomiting. Due to fears that meats and thicker-consistency foods would damage Melba’s stomach, Ana prepared her watery foods made mostly of broth. When asked to demonstrate how she normally prepared foods for Melba at the first visit of the intervention, she used a spoon to crush noodles and potatoes and added six tablespoons of broth, creating a watery preparation.

According to the food frequency questionnaire carried out on the first visit, Ana was providing Melba with a wide variety of animal-source foods, including beef, chicken, and hen to her granddaughter four to five times per week. However, upon further questioning and interviews, Ana made clear that the only form of meat she provided to her granddaughter was the animal bone to “suck on, nothing more,” she said. During an interview, Ana spoke about her granddaughter’s inability to eat meat

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prior to receiving the “*molinito*,” “*Before Friday* [when she received the “*molinito*”], *she could not eat it. No. She didn’t eat meat because her stomach failed. Because of this we didn’t give her meat. Only to suck on. After Friday, we give her meat because we have the ‘molinito.’*” During interviews, Ana was talkative and enthusiastic about the “*molinito*.” She expressed fears over what she would do if the “*molinito*” broke. She said she was excited to teach her daughter, Melba’s mother, how to use the “*molinito*” because she had a two-month old baby. When asked how Melba reacted to the food prepared in the “*molinito*,” she said, “*She loves it.*” She also remarked, “*The ‘molinito’ will help my child increase in height and weight.*”

At the final visit, when asked to prepare food for her granddaughter as she had been in the weeks since the start of the intervention, she grinded noodles, chicken, and potatoes in the “*molinito*” and added three tablespoons of broth to the preparation. The consistency of the food preparation was between watery and thick, demonstrating that she was providing thicker foods to Melba than she had at baseline. In the final interview, Ana did not express fears over thick foods or meats damaging Melba’s stomach as she had in the first visit of the intervention. She said, “*little by little, her stomach will get used to it,*” referring to thicker preparations and meat. The food frequency questionnaire administered during the final visit and final interview revealed that Ana now provided meat to Melba. In addition to eggs, milk, cheese and yogurt that she had been providing at baseline, Ana gave chicken and chicken viscera to Melba two to three times per week. When asked in the final interview how frequently she provided meat to her granddaughter prior to receiving the “*molinito*,” Ana said, “*Broth...broth and nothing more we gave her. No meat.*”

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Because she couldn't eat it with her stomach. She got sick.” When asked if her granddaughter continued to get sick when she eats meat, Ana said, “*No. Now she doesn't have problems.*”

Ana demonstrated progression during the course of the three-week intervention from providing watery foods and no meat to providing thicker consistency foods and meat to her granddaughter. The “*molinito*” appeared to alleviate Ana’s fears that providing thick consistency foods and meats to Melba would harm her stomach. In addition, the “*molinito*” facilitated her preparing and providing thicker foods and meat to her granddaughter. In terms of the MMN portion of the intervention, Ana had not received MMN from the health center. She was taught how to properly prepare the MMN and practiced the preparation method. The health center was also informed that she had not yet received MMN.

Case Study: Katerina

Another participant in the intervention, Katerina, has a fifteen-month-old daughter and three-year-old son. She lives with her children, husband, parents, sister, nieces and nephews in a small crowded house. Her parents own a bodega attached to the house. Katerina is reserved and shy. She dropped out of high school two years early when she became pregnant with her first child. She oftentimes is not at her house because she travels almost daily to her farm, which is one and a half hours away on foot.

When asked to demonstrate how she prepared food for her fifteen-month-old daughter Amelia, Katerina crushed potatoes and noodles with a spoon and added six tablespoons of broth, making a watery food preparation. When shown an example of

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a thick-consistency preparation, she said that she would not give this consistency of food to Amelia because it would “damage her stomach.” According to the food frequency questionnaire given at baseline and the interview with Katerina during the visit about animal-source foods, Katerina provided either egg, guinea pig, cheese, or chicken once per week to Amelia. Amelia consumed yogurt three times per week, making it her most frequently consumed animal source food. Hen and beef were provided to Amelia once per month. The low frequency at which she provided animal-source foods seemed to be due to the family’s lack of resources rather than fears over providing these foods to Amelia. The only animal source foods she said she would not give to her daughter was pork because it was “*too heavy*” for her stomach. When shown different images of animal-source foods, Katerina said her family consumed about one of these foods once per week because of a lack of resources and because her family does not raise many animals.

During the visit focused on reviewing the importance and preparation method of MMN, Katerina demonstrated how she normally prepared MMN for her daughter. She used the “*molinito*” to grind a potato, added four tablespoons of broth, and emptied the entire envelope of MMN. She said she normally prepared three to four tablespoons of food with the MMN and gave her daughter MMN daily. During the final visit, Katerina demonstrated the correct preparation method for MMN: she prepared two tablespoons of thick-consistency food and emptied the entire envelope of MMN.

At the visit following the introduction of the “*molinito*,” Katerina was asked to demonstrate how she prepared food for Ameila in her “*molinito*.” She grinded

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noodles and potatoes and added one tablespoon of broth, making a thick preparation. When asked whether the thick food upset her daughter’s stomach, she said Amelia had no stomach problems after consuming thick consistency foods. At the visit following the introduction of animal-source foods, Katerina said she tried grinding chicken in her “*molinito*.” She said the chicken came out very “*fine*” and that Amelia liked eating it. At the final visit, Katerina prepared food with a thick consistency in her “*molinito*” and said that Amelia continued to not have any problems eating thicker-consistency foods. The final food frequency questionnaire mirrored the food frequency questionnaire administered at baseline, showing no changes in the frequency at which Katerina provided animal source foods to Amelia. According to the questionnaire, yogurt continued to be Amelia’s most frequently consumed animal source food.

At the conclusion of the intervention, Katerina demonstrated a change in how she prepared foods for Amelia. At the first visit, she prepared watery-consistency due to fears over thicker foods causing stomach problems for Amelia. By the final visit, Katerina used her “*molinito*” to prepare foods of a thick consistency. However, due to a lack of resources to access animal-source foods, Katerina did not demonstrate an increase in the frequency in which she offered Amelia animal-source foods. Although the “*molinito*” facilitated Katerina’s preparation of thicker-consistency foods and helped diminish her fear that thicker foods would upset her daughter’s stomach, it was obviously unable to overcome the family’s lack of access to animal source foods. Katerina’s case highlights a significant barrier to providing animal-source foods to young children in Uyurpampa: lack of resources. When a family had

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access to animal-source foods, the “*molinito*” facilitated an increase in offering these foods to young children. However, the “*molinito*” did not facilitate an increase in offering of animal-source foods to children in low-resource households. Aside from the “*molinito*” intervention, projects and policies that increase low-resource households’ access to animal-source foods are necessary to increase young children’s consumption of these foods.

Conclusions

Based on the household trials carried out in Incahuasi, the “*molinitos*” appear to be a promising method of addressing child malnutrition in the region, where the rate of child malnutrition is 54% and the rate of anemia is between 70 and 80%. Due to the small sample size of fifteen participants, further investigation of the “*molinitos*” effectiveness in improving child feeding practices is warranted. Examining the effects of the “*molinito*” on clinical outcomes, such as growth and biomarkers like hemoglobin, is also necessary. However, the results from the household trials suggest that the “*molinito*” helps caregivers overcome their fears of providing thicker foods to their children. Furthermore, among households who have access to animal source foods, the “*molinito*” often facilitated an increase in the frequency and variety of animal-source foods offered to young children. Overall, the “*molinito*” also assisted caregivers in preparing MMN. If “*molinitos*” continue to show promise in addressing child malnutrition, they may be able to help confront child malnutrition in other parts of the world where caregivers have similar fears of providing thicker consistency and animal-source foods to their young children.

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Due to the prevalence of households that are unable to access animal-source foods on a regular basis, it is important to note that “*molinitos*” do not address all of the underlying causes of child malnutrition in Incahuasi. Infectious diseases such as diarrhea negatively impact children’s growth and development, and are not being addressed in this intervention. Mother’s health and nutritional status before and during pregnancy also impacts the growth and development of children, and was not addressed in the *molinitos* study. There are also obvious economic aspects of malnutrition that prevent some families from accessing nutrient-rich foods (in this case animal-source foods) on a regular basis. Therefore, improving the economic status of households and emphasizing animal-source food as an important investment in children’s futures is fundamental in improving the rates of child malnutrition in the region. Even among households that have the means to access animal-source foods, merchants in Uyurpampa oftentimes do not have animal-source foods to sell, limiting the variety and accessibility people have to these nutrient-dense foods.

“*Molinitos*” offer promise for curbing rates of child malnutrition in Incahuasi and potentially other parts of the world. If further investigation into the health outcomes associated with the “*molinito*” prove successful, the next step would be to determine how regional governments can incorporate the “*molinito*” into health systems and to study how to create a market for the “*molinitos*” in local economies.

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