Is urban agriculture associated with food security and nutritional status of preschool-aged children among low-income peri-urban households of Lima, Peru?

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Abstract

In the peri-urban slums of Lima, food insecurity and child malnutrition are prevalent. Urban agriculture (UA) is a coping strategy to help poor urban households meet food needs. This study investigated relationships between UA and food security, and children's diets and nutritional status among poor peri-urban households of Lima. Caregivers (n=197) of young children (9-71 mo.) were recruited from 40 community kitchens. Household sociodemographic, food security, UA activity, child health and anthropometric data were documented. The results revealed no differences between UA and non-UA households in household food security, children's nutritional status or diets. However, stratification of UA activity size into small, medium and large revealed greater frequency of consumption of animal source foods among children of large scale UA households, and decreased child height-for-age z-scores in small scale UA households, but no differences in food security. These findings suggest UA of sufficient volume may contribute to improving children's diets.

Résumé

Dans les bidonvilles périurbains de Lima, l'insécurité alimentaire et la malnutrition de l'enfant sont des problèmes de premiers ordres. L'agriculture urbaine (AU) est une stratégie d'adaptation qui aide des familles pauvres dans les zones urbaines à satisfaire leurs besoins alimentaires. Cette étude a enquêté sur les rapports entre l'AU et la sécurité alimentaire, et l'alimentation et le statut nutritif des enfants parmi les foyers pauvres périurbains de Lima. Les personnes principalement responsables des soins des petits enfants des foyers ont été recrutées des cuisines communautaires. Information sur la socio-démographie, sécurité alimentaire, et l'activité d'AU du foyer, ainsi que les données anthropométrique et la santé de l'enfant ont été documentées. Les résultats n'ont pas révélé de différences au niveau de la sécurité alimentaire entre les foyers qui se livrent à l'AU et ceux qui ne font pas d'AU, ni pour le statut nutritif ou l'alimentation d'enfant. Pourtant, la stratification en bas, moyenne et haute intensité d'activité AU a révélée la plus haute fréquence de consommation d'aliments de source d'animal parmi les enfants des foyers avec beaucoup d'activité AU, et des z-tas d'hauteur-pour-âge diminués parmi les enfants des foyers avec un minium d'activité AU, mais aucune différence dans le statut de sécurité alimentaire. Ces conclusions suggèrent que l'AU peut contribuer à l'amélioration d'alimentation d'enfants.

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Contribution of authors

The writing of the manuscript included in this thesis was achieved through the combined input of the co-authors. The authors were A.E. Maldonado, G.S Marquis, H. Creed-Kanashiro and M. Carrasco. A.E. Maldonado developed the research questions, drafted the project proposal, helped to write the CIHR-funded intervention proposal, and designed survey tools prior to traveling to Lima, Peru to complete the data collection for the study. In Lima, A.E. Maldonado and M. Carrasco coordinated and managed the project team, adapted and refined survey tools, and also collected data in the field by carrying out interviews. M. Carrasco was responsible for training field workers in data collection techniques, taking care of logistical issues and provided guidance in data collection through her nutritional expertise. M. Carrasco was responsible for quality control for certain data collection instruments, ensuring completeness and accuracy of the information provided. G.S. Marquis and H. Creed-Kanashiro wrote the CIHR-funded proposal, reviewed the data collection tools, and provided guidance throughout the data collection phase of the project. Upon return to Montreal, A. Maldonado analyzed the data and wrote the thesis under the guidance of G.S. Marquis. G.S. Marquis, H. Creed-Kanashiro and M. Carrasco edited the manuscript. The data collected for this project are part of this thesis, and also are the diagnostic baseline for the CHIR-funded intervention pilot project being carried out by G.S. Marquis, H.Creed-Kanashiro and M. Carrasco.

Table of Contents

List of tables

List of figures

List of appendices

List of abbreviations

ASF – Animal source foods

ANOVA – analysis of variance

CIP – Centro Internacional de la Papa (*International Potato Centre)*

cm - centimetres

FAO – Food and Agriculture Organization

HAZ – Height-for-age Z-score

HFSSM – Household Food Security Survey Module

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

kg - kilograms

LAZ – Length-for-age Z-score

LC – Lurigancho-Chosica

NA – not applicable

SD – standard deviation

UA – Urban agriculture

USDA – United States Department of Agriculture

y - years

WAZ – Weight-for-age Z-score

WHO – World Health Organization

WHZ – Weight-for-height Z-score

wk - week

WLZ – Weight-for-length Z-score

1. INTRODUCTION

Rapid growth of cities in low-income countries throughout the world has been associated with an increase in slum settlements, urban poverty and food insecurity [1-3]. Urban agriculture (UA) has been identified as an important strategy for sustainable urban development that generates greater food security for the landless urban poor. UA is often an important coping strategy when food access is compromised due to unemployment, under-employment and the rising costs of basic food staples [4]. With child malnutrition being an increasingly important concern for urban centres in low-income countries throughout the world [5, 6], it is important to consider UA's potential to address household food insecurity, a key factor affecting child nutritional status [7]. The slum settlements on the outskirts of Lima, where poverty and malnutrition are prevalent, are examples of the extensive urban growth being experienced among low-income countries around the world. Lima's poor peri-urban communities are also illustrations of UA being put to use as a coping strategy for the urban poor to secure food for their families. Most research concerning the relationship between UA and food and nutrition security has principally investigated UA engagement in the form of crop cultivation; however, in the peri-urban communities of Lima low-income households almost exclusively engage in livestock rearing. Thus, the current study examined the relationship between UA status in the form of animal farming and 1) household food security and 2) children's nutritional status among low-income households in a peri-urban district of Metropolitan Lima.

1.1 Objectives and hypotheses

Overall objective:

This study examined the role of animal raising on household food security, children's diet and nutritional status in a peri-urban area of Lima, Peru. The information provided will serve as the baseline for a pilot project funded by the Canadian Institutes of Health Research (CIHR). This pilot project is currently being carried out as a joint initiative by the Nutrition Research Institute of Lima (IIN), McGill University and the International Potato Centre (CIP) to promote and support UA as an approach to provide better food and nutrition security to low-income households.

1.1.1 Primary objectives:

1. To examine the association between UA practices and household food security measures in the context of a low-income peri-urban community of Lima.

   Hypothesis I: Households that participate in UA have higher scores on a measure of food security than those households that do not participate in urban agriculture.

2. To examine the association between UA practice within a low-income urban household and children's nutritional outcomes.

   Hypothesis II: There is a positive association between UA activity and attained height-for-age for preschool-aged children among low-income urban households.

1.1.2 Secondary objective:

To examine the association between UA practices within low-income urban households and measures of dietary quality.

Hypothesis III: Households that are engaged in UA will have more animal source foods available for household consumption than households not engaged in urban agriculture.

2. LITERATURE REVIEW

2.1 Recent rise in urban agriculture

During the last few decades, UA has increased greatly worldwide. There are currently approximately 800 million urban citizens worldwide involved in UA in some way [8]. Parts of Africa, Asia and Latin America have experienced a surge in urban agricultural production in recent years. For example, it was estimated that the overall proportion of the African urban population involved in urban cultivation was 10–25% in the early 1980s, whereas this proportion rose substantially during 1990s, reaching 70% in the city of Dar es Salaam [9]. In 1996, the UNDP estimated that 800 million people around the world were engaged in UA and that approximately 33% of urban families were producing about a third of all food consumed in cities during the early 1990s [8]. Though agriculture has traditionally been considered a rural activity, it is now being carried out by approximately 200 million urban farmers who provide 15% to 20% of the world's food [10].

Subsistence farming within city limits has recently come to the forefront as a strategy to reduce food insecurity and malnutrition among poor urban households in low-income countries in the face of rapid urbanization and population growth. There are approximately 1 billion poor people in the world, 75% of whom are living in precarious urban settlements without adequate shelter or basic services [2]. Furthermore, the world slum population is expected to rise to 1.5 billion by 2020 based on current rates of growth [11]. World Bank and World Health Organization (WHO) data show that in the majority of low-income countries, the absolute number of poor is increasing and the proportion of all poor people who reside in urban areas is rising [1, 12, 13]. A consequence of increasing poverty and food insecurity in urban zones is an increase in the absolute number of malnourished young children who reside there, and an increase in the urban proportion of all malnourished children [1].

2.1.2 What is urban agriculture?

UA encompasses the production, processing, and marketing of food within a town, city or metropolis on land and water dispersed throughout the urban and peri-urban area[1] [8]. Most urban farmers are low-income women and men who cultivate food mainly for household consumption [4].

Though the practice of UA is not new, the discipline of UA is still very young and lacks a thorough supporting body of literature that is evidence based [14]. It has been suggested that UA can have a crucial impact on many dimensions of urban livelihood, including health, social, economic, and environmental conditions [4, 8, 14, 15]. Although it is presumed that better nutrition can result from the practice of UA, studies that have actually carried out comparative analyses between farming and non-farming urban residents are few. The most notable of these are the studies carried out by Maxwell, Yeudall and Bahiigwa and their research teams in Uganda and by Mwangi-Mboganie and Foeken in Nairobi, Kenya.

2.1.3 Urban agriculture, food security and children's nutritional status

A cross-sectional study carried out by Maxwell et al. in Kampala, Uganda, in which they examined the relationship between UA and nutritional status at the household level, found that UA engagement was positively associated with children's height-for-age Z-scores [16]. The study found that even when controlling for socioeconomic status (SES), the prevalence of stunting[2] and being underweight[3] were significantly lower among children in farming households than in non-farming households ($p < 0.05$); this relationship was particularly strong among households of very low SES. It was also found that farming was significantly associated with more maternal

[1] As defined by Mougeot [11] of the IDRC, urban agriculture is as "an industry located within (intra-urban) or on the fringe (peri-urban) of a town, a city, or a metropolis, which grows and raises, processes and distributes a diversity of food and non-food products, (re-) using largely human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area".

[2] Height-for-age Z-score (HAZ) < -2SD below NCHS/WHO International Growth Reference.

[3] Weight-for-age Z-score (WAZ) < -2SD below NCHS/WHO International Growth Reference.

time allocated to direct childcare across all SES groups ($p < 0.05$). However, linear regression analysis could not show a relationship between maternal time allocated to direct child care and child nutritional status.

The main respondents of the study, who were also the main actors in urban agricultural production, were the women in the households [16]. The women cited two major reasons for engaging in UA: the rise in the real cost of living due to the economic crisis in the city and the lack of an alternative way to provide food for their families. They also said that farming, compared to other types of informal work, allowed them to provide more direct care of their children – confirming the quantitative analysis. UA was therefore an important strategy among these women to meet household food needs.

Mwangi-Mboganie and Foeken [17] carried out a study on UA, food security and nutritional status in Nairobi, Kenya, where illegal urban cultivation of unclaimed sites had been increasing in intensity. Extremely poor, unemployed, landless women were especially engaged in this activity and were carrying out the majority of the urban farming of vacant spaces throughout Nairobi for household food consumption. All households in the sample (both farming and non-farming) had few opportunities for employment and low welfare levels. Sampled households were assigned to one of two categories: UA or non-UA. The wives of the household-head or the female heads of households were recruited exclusively for interviews.

Except for one individual, all farmers surveyed identified the major reason for their participation in UA as a need for food. One-third of all study participants also identified a need for income generation. The UA group appeared to be moderately better in terms of food security than the non-UA group and had fairly better average energy and protein intakes. It appeared to the researchers that this related to the sizeable contribution of self-grown food to the diet among UA households. Nutritional status was evaluated for all children between 6 and 60 months of age in both groups. Children from farming households had moderately better nutritional status compared to the

non-farming households in terms of wasting[4] and underweight. However, the percentages of stunting among children were similar between both groups. This last result led the authors to propose that a greater availability and supply of food for household consumption from urban farming may be more meaningful for the household material welfare level than for the long-term nutritional status of children in these households.

An important finding in this study was that the duration of residence in the city was an important factor affecting food security and purchasing power of low-income households. The longer the households had resided in the city, the more extensive their support networks and the more opportunities they had of obtaining land for cultivation, formal employment and income generating activities. Lastly, the authors pointed out that households in Nairobi who were participating in self-initiated UA most often did so amid very difficult conditions; they had to rely on rainfall, often had no technical agricultural training, received no technical assistance and were constantly faced with security problems of theft and/or eviction. Despite these constant impediments, urban farmers were still able to benefit from this activity in various ways. Thus the authors argue for the potential of UA to greatly improve household food security with greater support from local authorities [17].

In Kampala, Uganda, Yeudall et al. carried out a cross-sectional study similar to that of Maxwell et al. [16] in which they recruited households that included at least one child aged 2 to 5 years to investigate the impact of UA activity on nutritional status [18]. Researchers in this study were also interested in UA's impact on dietary diversity and food security. As in the studies led by Maxwell et al [16], and Mwangi-Mboganie and Foeken, the primary caregivers of the households were recruited for study participation. In total, 296 households were part of the study, 235 farming and 61 non-farming, however only 215 had sufficient complete data. Crops were grown by 215 households and 139 produced livestock. They separated the activities of

[4] Weight-for-height Z-score (WHZ) < -2SD below NCHS/WHO International Growth Reference.

growing crops and producing livestock and analyzed the effects of these activities individually. Crops were primarily grown for consumption purposes, while livestock were more likely to be kept for the purpose of commercial sale.

As anticipated by researchers, children from households that engaged in some form of UA consumed significantly higher proportions of home-produced foods than children from households not engaged in UA ($p < 0.001$), yet there was no difference between groups in food and nutritional security status. However, household food security (HFS) status was significantly positively correlated with the amount of livestock being raised ($r = 0.142$, $p = 0.017$). They also found that HFS was positively correlated with dietary diversity ($r = 0.230$, $p < 0.001$), percentage of energy from animal source foods (ASF) ($r = 0.185$, $p = 0.002$), and WAZ ($r = 0.149$, $p = 0.017$), but not with HAZ ($r=0.109$, $p=0.076$). Households that raised livestock (regardless of whether they grew crops or not) had significantly higher dietary diversity scores than children from households that did not, and there was a trend towards significance of better child growth among these households. There were no significant differences between households that did and did not engage in crop cultivation in any of the anthropometric variables of the index children[5]. In general, there were no significant differences in measures of food or nutrition security between farming and non-farming households. An important conclusion of the study was the important contribution of UA in the form of livestock rearing to the availability, access and utilization of ASF in the diets of children to thereby improve nutritional status [18].

2.1.4 UA in Lima, Peru

Urban Harvest is a system-wide initiative by the Consultative Group on International Agricultural Research (CGIAR) aimed at supporting UA research and training in cities of low-income countries in Latin America, Africa and Asia. The research and outreach activities of Urban Harvest

[5] HAZ, WAZ, ZBMI (body mass index z-score), ZMUAC, mid-upper-arm circumference z-score.

include advocating the crucial role of UA in generating income and employment in peri-urban low-income areas. Their research on UA in Lima has mostly focused on its impact on the urban environment; development of sustainable technologies and practices for increasing the productivity and marketing expertise of urban and peri-urban farmers; support of proper management and safe use of agricultural and natural resources in urban areas; and encouragement of municipalities to develop policies that support safe and more secure food production in urban areas. They have recognized the role of UA in food and nutrition security among low-income households in the peri-urban areas of Lima, but have yet to formally evaluate this relationship.

One of Urban Harvest's researchers recently examined current practices of peri-urban agriculture in the eastern shanty towns of Lima, where she found there a clear division of labour along gender lines among residents [19]. In this context, men were largely responsible for cultivation and harvesting of vegetables while women took care of small-scale animal-raising and marketing responsibilities. Arce suggested that this inherent dynamic of UA may have significant impacts on how it is utilized as a strategy to improve household food security and nutrition. She described how men typically attempt to provide for their families more through income generation, while women attempt to provide for their families more through reproductive activities and the direct provision of food; this has important implications for UA. As men are usually the ones who control the urban agriculture in Lima, the profit generating capacity of this commodity is considered before its utilization within the home. She and other researchers of Urban Harvest expressed that there is a void in understanding the impact of UA on household food security and nutrition in the Peruvian context and have called for more systematic analyses [20].

2.2 Household food insecurity

Household food insecurity (HFI) reflects a situation in which a household is not able to access to sufficient, safe and nutritious food to meet

the dietary needs of all its members, thus posing a risk to the sufficiency of dietary intake for young growing children [7]. Furthermore, a household is considered to be food insecure when its members experience anxiety about their ability to acquire or produce food for household consumption [21].

2.2.1 Development of a measure of household food security

The concept of food security (FS) originally came out of efforts to address the immediate and underlying determinants of hunger during the 1980s. Food insecurity (FI) describes not only the physiological expression of under-nutrition, but also the psychological and emotional awareness of experiencing or expecting a shortage of adequate food.

One of the first studies to define and measure the experience of food insecurity (FI) in the United States was carried out among 32 women in upstate New York [22]. Responses from qualitative in-depth interviews were used to develop a conceptual framework of hunger and FI. Important components of this framework were the distinction made between household and individual hunger, as well as the representation of hunger as a "managed process". In the next phase of the study this framework was tested for validity and reliability by surveying another 189 women who were asked to agree or disagree with the statements made by the previous interviewees. The result was a survey tool that was shown to be reliable and to have both construct and content validity. An important recommendation of the study was that a separate assessment should be done for each level of the household - the whole household level and the individual level – and that women need to be assessed separately from their households. This recommendation stems from observations in the study that, within a particular household, members of the family can experience hunger and/or FI at different times and to different degrees [22].

In 1987, the Community Childhood Hunger Identification Project (CCHIP) was established to construct a measure of hunger that would be appropriate for developed countries such as the US where an absolute lack of

material resources and severe under-nutrition were rare, but where relative material deprivation was still occurring [23]. The food security measure was created by CCHIP specifically to determine the prevalence of hunger among low-income families in the US with at least one child less than twelve years of age. To test the measure they did a study in Seattle, Washington among 407 low-income households, of which 80% had incomes below 100% of the Federal Poverty level. The results of their validation study indicated that the CCHIP hunger index had strong internal content and construct validity - the hunger scale and the hunger score were both associated strongly with many *a priori* determinants and consequences of hunger.

Subsequently, the results of the above mentioned studies were used to develop conceptual definitions of "food security" and "food insecurity" [24]. These conceptual definitions provided the impetus for an initiative by the United States Department of Agriculture (USDA) and the Department of Health and Human Services (DHHS) to construct operational definitions of FI and hunger suitable for use in large national population surveys. These two organizations formed the *Federal Food Security Measurement Project* with the aim of developing a food security questionnaire that could be incorporated as a supplement to the Current Population Surveys (CPS) administered by the Census Bureau. This came to be called the Food Security Supplement (FSS). Incorporated into the section of the FSS on food sufficiency and security was the Household Food Security Survey Module (HFSSM), which has been in use in the National Health and Nutrition Examination Survey (NHANES) since 1999. Its items allow for identifying and classifying levels of food insecurity [24].

The HFSSM has since been translated into Spanish for use among the US Hispanic population [25, 26] as well as for use internationally [27]. Due to the simplicity and effectiveness of the USDA tool, several countries in Africa, Asia and South America have employed an adapted version of the tool to assess food security [27-29]. In Peru, researchers at the IIN validated a translated and adapted version of the USDA HFSSM which could be used

quickly and efficiently among both urban and rural communities [29]. The results of their validation study led to the inclusion of additional topics to the Module such as access and motivation to participate in food assistance programs and cultural patterns regarding food consumption and use. Results from the quantitative field survey showed strong findings in the reliability of the instrument.

2.2.2 Food security and determinants of nutritional status

Several studies have been carried out to examine the relationship between FI and determinants of child growth, as well as between FI and the outcomes related to nutritional status. Kendall, Olson and Frongillo carried out a study among low-income household with children in rural New York State to determine whether food security status was associated with dietary intakes and availability of household food supplies [30]. They found that low food security was associated with decreased quantity and variety of fruits and vegetables consumed by children. Nutrient intake was lower for food insecure households for all nutrients except for vitamin A and fat. Children of food insecure households were much less likely to meet dietary recommendations for vitamin C, fruits and vegetables than food secure household. Also food secure households had much lower food supplies than food secure household [30].

Melgar-Quiñonez and Kaiser [26] carried out a cross-sectional study among Mexican-American families examining the relationship between food insecurity and preschool-aged children's dietary intakes. Most households reported some level of FI, 27% of which were severely food insecure with children experiencing chronic hunger. When controlling for acculturation, they found that children from severely food-insecure households had lower servings of the five Food Guide Pyramid groups compared to children from households that were not food insecure. Melgar-Quiñonez and colleagues also did a cross-sectional study in Bolivia, Burkina Faso and the Philippines to determine how a food security measurement tool performed across different

settings and cultures as an indicator of food expenditure [27]. The results of the study showed that in all three countries, food secure households had significantly higher daily per capita (DPC) food expenditures than those households that were less food secure ($0.001 < P < 0.01$). It was also shown that food insecure households had significantly lower DPC expenditures for animal source foods, particularly meat, dairy and eggs. Their findings suggest that using a modified version of the USDA HFSSM can be a cost-effective and straightforward method for measuring food security status, and correlates well with food expenditure and food consumption of low-income households in different countries and across cultures.

In Trinidad and Tobago, Gulliford and colleagues carried out a study on adult men and women to determine the relationship between food insecurity and income, dietary intake and nutritional status [28]. Their findings showed that food insecurity was associated with lower incomes and lower consumption of fruits and vegetables. They also found that food insecure individuals were more likely to be underweight than overweight, although food insecurity was frequent at all body mass index (BMI) levels. The above research findings support the notion that food security correlates strongly with household socioeconomic status and dietary diversity, which are important determinants of child nutritional status.

2.2.3 Community kitchens and food security in Latin America

One of the most notable examples of community grass-roots organizing to confront food insecurity and hunger is that of the Community Kitchens (Comedores Populares) in Lima, Peru. During the 1960s and 1970s, mothers in the newly-formed slums began organizing in response to the economic crisis and their increasing inability to provide adequate nutrition for their families [31]. They began to pool resources together, buying in bulk and cooking as a group. These kitchens became increasingly popular among the poor slum dwellers and multiplied in great numbers, forming a vital community resource to which women could turn to help their families survive.

By the late 1970s these organizations began to receive food aid and other assistance from non-profits, government and donor agencies. A review by the International Food Policy Research Institute of the role of these organizations in supporting community kitchens suggested that this assistance helped greatly to reduce food insecurity and hunger during the height of the economic crisis of the 1980s [32].

In 1985, Katona-Apte demonstrated the effectiveness of community kitchens to improve the diet diversity of all members of participating households [33]. Data were compiled from 240 sets of 24-hour household food records of eight households – four that participated in community kitchens and four that did not – for 30 days. Households participating in community kitchens had greater diet diversity than non-participating households, eating more food items per day and more total food items. Other qualitative studies have shown that in addition to providing low-cost food to fight hunger and malnutrition, community kitchens have served as venues for women to become empowered through organizing with peers, to receive education on proper hygiene and nutrition in order to better care for their children.

Another example of community organization around food is Brazil's Zero Hunger Program (Projeto Fome Zero), which has incorporated the use of community kitchens as an integral part in their efforts to reduce hunger, malnutrition, child mortality and poverty [34]. The Cozinha Brazil Program launched in 1999 by the Social Services for Industry agency in Sao Paolo, combined with Fome Zero to produce low-cost food with high nutritional value to impoverished communities [35]. These sites offer free nutritional education and cooking classes in the hopes to improve household nutritional practices and reduce child malnutrition.

2.3 Child nutritional status

Child growth is widely accepted as the one of the best indicators of well-being and good health among young children. This is because poor

dietary intakes (in both quantity and/or quality), illness, or a combination of both these factors are immediate contributors to compromised growth [36]. Stunting [6] is one of the most pervasive forms of malnutrition globally [37]. Studies have demonstrated several long-term detrimental effects of stunted growth, including poor academic performance in later childhood [38] and reduced productivity in adulthood [37, 39]. The factors leading to stunted growth, which are multi-leveled encompassing child, maternal, household, community and societal factors [7, 40], are discussed below.

2.3.1 Dietary adequacy

Diversity within the diet is thought to reflect nutrient adequacy, which is directly associated with child nutritional status [7]. Diet diversity is a term that refers to the variety of food items or food groups within the diet of individuals, households or communities [41]. Heavy reliance in low-income countries on limited varieties of low-cost staple starches, resulting in inadequate diets deficient in important micronutrients necessary for proper growth and development, is one of the leading factors contributing to child stunting.

Low dietary diversity has been shown to be strongly associated with high rates of stunting among children living in low-income countries even when controlling for socioeconomic status [42, 43]. Studies conducted by Onyango et al. in eastern Africa and Hatloy et al. in western Africa both found significant relationships between dietary diversity and the proportion of nutrient requirements being met among infant and preschool-aged children [43, 44]. In their study, Onyango et al. also found consistent positive associations between diversity of the diet and all anthropometric outcome measures[7] [43].

Following these studies, Arimond and Ruel wanted to verify whether these results would hold true across different countries and cultures while controlling for the effects of socioeconomic factors [42]. The main objective

[6] Height-for-age Z-score < -2SD below NCHS/WHO International Growth Reference.
[7] HAZ, WAZ, WHZ, Mean Upper Arm Circumference (MUAC) and Triceps Skinfold (TSF).

of their study was to examine whether dietary diversity would be independently associated with HAZ scores and that this association would be due to greater nutrient adequacy, rather than due to dietary diversity being a good proxy for household socio-economic status. They carried out this investigation by using eleven different Demographic and Health Surveys of low-income countries from Africa, Asia Latin America and the Caribbean. In ten of the eleven countries studied, dietary diversity was significantly and positively associated with HAZ, regardless of household socioeconomic status. These findings therefore strongly suggest that incorporating a wide range of foods and food groups into the diet of young children encourages better nutrition and growth. However, even if the household can access a sufficient amount and variety of healthy and nutritious foods to offer to the child, other factors such as child health status and care practices mediate the utilization of those foods.

2.3.2 Children's health status

Malnutrition and infection are very closely inter-related states and interplay to create a vicious cycle, especially in urban slum settlements of low-income countries such as Brazil [45], India [46] and Peru [47, 48]. It has been shown in many studies of children in low-income countries that inadequate diets associated with micronutrient deficiencies lead to impaired immune functioning, resulting in increased risk of developing respiratory and gastrointestinal diseases. Pre-existing deficiencies in vitamin A and zinc, both of which play important roles in immune function, have been shown to increase the risk of acute respiratory infections (ARI) and diarrhea in India and Indonesia [46, 49]. In turn, these diseases worsen children's nutritional status by compromising dietary adequacy, causing further nutrient deficiency [48, 50, 51]. Reduced appetites [47, 52], malabsorption of nutrients due to intestinal interference [53] and excess losses of nutrients [50] are mechanisms by which ARI and diarrhea lead to deteriorated nutritional status among young children. Decreased appetite is an especially concerning issue because

it “is a central component in the decision-making process used by caregivers to determine when and how much to feed their infants” [54]

As described in the UNICEF conceptual framework of the causes of child malnutrition [7], children health status is not only affected by the dietary intake of child, but also is influenced by the quality of care provided by mothers as well as the health of the environment. Infection and disease among children is rampant in poor urban and peri-urban communities of low-income countries due to extensive poverty and inadequate access to basic necessities [55]. Unavailability of clean water and sanitation, crowding and indoor air pollution are realities in both rural and urban settings that put children at increased risk of developing acute respiratory infections and diarrhea [55-58]. Lack of proper water storage facilities and post-source contamination is a common problem in peri-urban communities such as those of Lima, Peru [56]. It was previously shown that inadequate water storage doubled the risk of developing diarrheal disease among young Peruvian children in poor communities of Lima [59]. Many nutrition researchers however believe that good caregiving and infant feeding practices impact more on child nutrition and growth than socioeconomic or food security factors.

2.3.3 Maternal and childcare practices

“Care” refers to the “behaviours performed by caregivers that affect nutrient intake, health, and the cognitive and psychosocial development of the child” [60]. These behaviours consist of care for pregnant and lactating women; breastfeeding and complementary infant feeding; psychosocial stimulation and support for child development; food preparation and food storage behaviours; hygiene behaviours; and care for children during illness, including diagnosis of illness and health-seeking behaviours [7, 60, 61].

Researchers Nti and Lartey recently demonstrated that superior caregiver practices can result in better child nutritional status even amidst poverty and widespread malnutrition [62]. Their longitudinal study in rural Ghana followed 100 children 6-12 months of age. Important care behaviours

related to infant feeding were identified and observed during the main meal of the day once a month for a period of 6 months. They used a positive deviance approach, identifying those children who were able to grow at a better rate than expected given the many limiting factors to good health and nutritional status in their environments. Positive-deviant children had WAZ and length-for-age (LAZ) scores above the median for the study population; negative-deviant children scored below the median. Nutritional status (WAZ, LAZ and weight-for-length (WLZ)) was significantly lower among negative-deviant than the positive-deviant children ($p \leq 0.05$). Caregivers of positive-deviant children provided meals more frequently to the children ($p<0.001$), were able to feed responsively to a greater degree ($p<0.001$), demonstrated better hygiene practices during feeding ($p=0.05$) and fed their children on a more consistent schedule ($p=0.05$) than caregivers of negative-deviant children. Previous studies on positive deviance and feeding behaviours also support the notion that better care and feeding practices lead to better nourished children [62].

The provision of good quality care is determined by many caregiver and household-level factors. Armar-Klemesu et al. [63] did a study among 556 households with children under 3 years of age in Accra, Ghana to see the impact of different maternal and household-level factors on child care practices. Child care practices were subdivided into three categories: 1) child feeding behaviours; 2) health seeking behaviours; and 3) hygienic practices. In their multivariate analysis they found of all the maternal and household factors considered, only maternal schooling was significantly associated with all three categories. Lack of household resources was associated with health seeking behaviours [63].

Ruel et al. [64] in Lesotho investigated whether maternal nutritional knowledge mediated the impact of maternal schooling on child nutritional status. They found an interaction between maternal nutritional knowledge and maternal schooling impacted WAZ of children; however, this interaction was only significant among households of higher socioeconomic status. Thus the

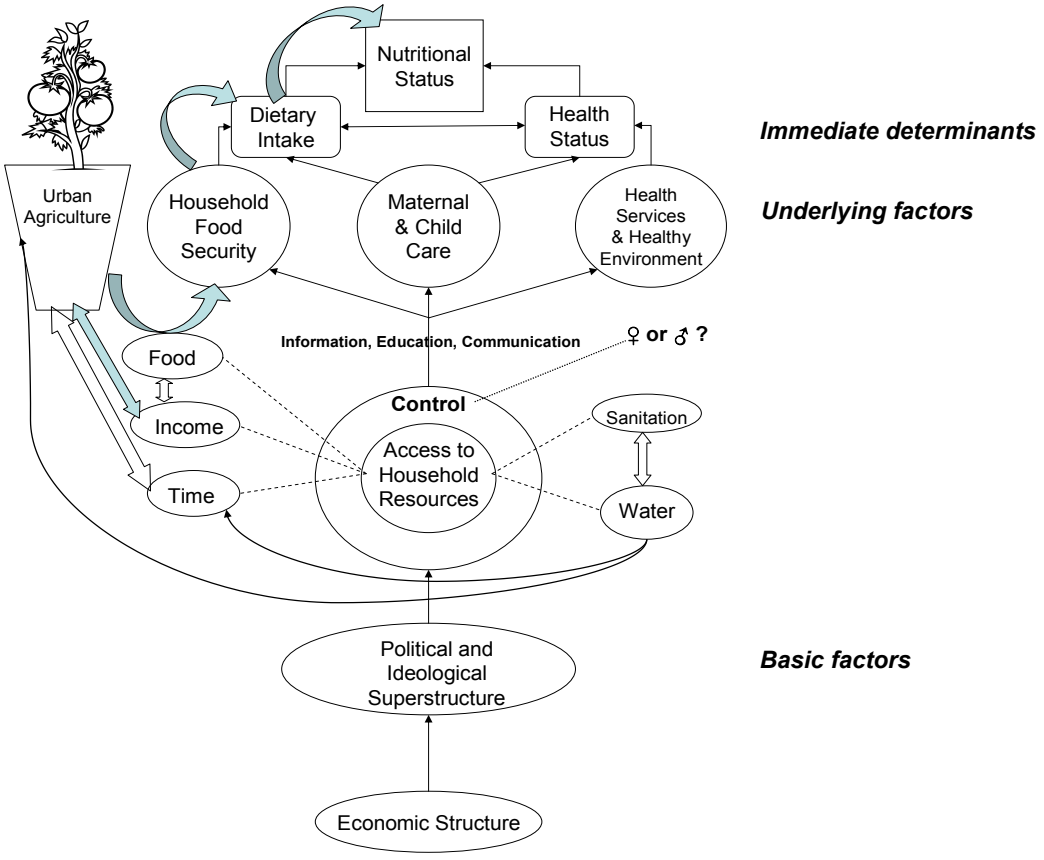
impacts of maternal schooling and maternal nutritional knowledge on nutritional status have not been shown to be independent of household socioeconomic factors.

Greater women's status and control over household resource allocation has also been found to significantly impact the nutritional status of children. Studies among low-income countries in South Asia, Sub-Saharan African and Latin American and the Caribbean among poor rural households reveal consistently that when women have increased status, autonomy and control over household resources, this raises the amount of household resources allocated toward children's education, health and nutrition [65]. The results of all these studies on the determinants of child nutrition clearly demonstrate that the potential of a child to achieve optimal growth and health is dependent on numerous multi-level interrelated factors.

3. METHODS

3.1 Conceptual framework

The conceptual framework illustrating the proposed relationships between UA and HFS, diet and nutritional status of children (Figure 4.1) is an adaptation of the UNICEF model which incorporates factors at the household and societal levels leading to child malnutrition described in Chapter 2.



Legend: (adapted from UNICEF, 1990)

Indicates hypothesized relationships to be investigated

Associations established in UNICEF model

Types of household resources

Unknown relationships not considered

Figure 3.1: Conceptual framework

In this study in Lima, Peru, UA was assumed to be associated with improved food and nutrition security through its effect on immediate and underlying factors of the conceptual framework. UA participation was hypothesized to improve household food security, thus improving the quantity and quality of the household diet and children's anthropometric outcomes, by increasing direct access to resources such as home-grown food for household consumption and surplus income for purchasing food.

However, it was also important to consider the potential limitations of the health benefits of UA, particularly in poor households in low-income countries. In the research site for this study there is typically almost no rainfall throughout the year. All agricultural activities in the region must rely on irrigated water that is highly susceptible to contamination. The use of untreated water for irrigation may pose serious health risks to farming households, thereby possibly counteracting the nutritional value of home-produced food. Furthermore, the possible health risks of living in close proximity to livestock in an urban setting are also of concern, particularly among young children [66].

Furthermore, UA's impact on time available for direct childcare should be taken into consideration. Maxwell et al. [16] found that engagement in UA was associated with increased time for direct childcare; however Bryld warns that UA may place an added burden on women, contributing to an even longer workday [67]. If the time allocated to UA displaces time that would be allocated to childcare, this may also negatively influence the nutritional status of children.

3.2 Study design

This study employed a mixed-methods cross-sectional design, comprising both qualitative and quantitative components.

3.3 Study site

Data collection was conducted among low-income households in two peri-urban communities in the eastern district of Lurigancho-Chosica (LC)

within Metropolitan Lima, the capital city of Peru (Figure 3.2). The two neighboring communities of Nievería and Huachipa within LC were selected for this study due their high prevalence of poverty, malnutrition and animal raising activity. This study provided a unique investigation of UA engagement among low-income peri-urban households due to the main form of UA being practiced – livestock rearing. Lima, situated in the coastal desert region of Peru, has the lowest annual rainfall of any large metropolitan area in the world. Due to such minimal precipitation, conditions in the peri-urban areas are extremely harsh and non-conducive to crop cultivation, making this activity possible only through intensive irrigation. Low-income and mostly landless households participating in our study did not possess the resources necessary to engage in crop cultivation; rather, these households if engaged in UA were almost exclusively rearing livestock such as chickens, pigs and

Figure 3.2: Map of the area of study area: Lurigancho-Chosica, Lima Peru

guinea pigs. Documentation of such distinctive UA behaviour in comparison to previous studies is hoped to provide a unique contribution to the literature

of the associations between UA and food and nutrition security in different contexts.

The following justification of the study site addresses the prevalence of poverty, food insecurity and child malnutrition in Peru and specifically in Metropolitan Lima and its slum settlements. The preponderance of engagement in local community kitchens and in UA activities as coping mechanisms in the peri-urban districts where the study occurred will also be detailed.

3.3.1 Peru

Almost one half (14 million people) of Peruvians currently live in urban slums, a sector that is growing at an annual rate of 3% [68]. The slum-to-urban ratio[8] in Peru is currently 68% [11]. This situation is projected to become much worse in the next decade due to forecasts of vast urbanization and population growth. In a recent UN Human Settlements Programme Report, Peru had the worst predictions among all countries in the region of Latin America and the Caribbean for the number of people that are expected to be living in slums in conditions of extreme poverty by the year 2020 [69]. This report estimates that the number of Peruvians who will be living in precarious urban and peri-urban settlements will increase from 14 million to 24 million.

Currently, 30% of Peruvian children under 5 years of age suffer from chronic malnutrition in the form of stunting, 8.5% are severely stunted[9] [70-72]. This is a much higher prevalence rate than that for the region of South America (9%) [73]. Iron deficiency is also a widespread nutritional problem in Peru, affecting more than half of all children under 5 years of age and 76% of children under 2 years of age [71]. Though the proportion of malnourished children who reside in rural areas is greater than in urban areas, the rates of malnutrition tend to be higher in the outskirts of urban centers than in the city cores.

[8] The slum-to-urban ratio is the % of total slum area to the % of the total urban area.
[9] Height-for-age Z-scores < -3 SD

3.3.2 Lima

In 1981 the population of Lima was 4.2 million people. Today the number of residents in Lima has reached more than 7.6 million, accounting for approximately 32% of the total population of Peru [74]. The large majority of this growth has taken place along the periphery of the city centre [9]. In Metropolitan Lima, 24.2% of all residents (nearly 3.6 million) are classified as living in poverty[10]. In 2007, 13.5% of residents of Metropolitan Lima lacked access to at least one basic necessity[11] [74]. Delayed growth in height-for-age currently affects 7% of children under 5 years of age residing in Lima. The proportion of children in Lima who are underweight is 0.5%, while the proportion of children who are wasted is 0.1% [74].

3.3.3 Eastern Cone district of Lurigancho-Chosica

Chronic malnutrition in the Eastern Cone district of Lurigancho-Chosica (LC) is estimated to affect 14% of children under the 5 years of age [74]. The prevalence of anemia among children under five years of age residing in this district is 50% [75]. A higher proportion of LC residents live in poverty (68%) and extreme poverty (16%) compared to the overall rates for Metropolitan Lima [76] and many poor families rely on social food programs such as the government-funded Community Kitchens and Glass of Milk Programs [31, 77]. In the peri-urban communities of LC, constraints to food security arise from a lack of access to food due to a shortage of economic resources, low purchasing-power and lack of information [31].

Until recently, LC was predominantly an agricultural zone; however it is now quickly losing its productive terrain due to rapid urbanization and population growth. As people continue to move into the area, fertile agricultural land is being converted to housing settlements at a rate of 29 hectares or 7.3% per year [15, 19]. In 2005, the terrain in LC was 46% urban,

[10] 39.3% of the total population of Peru lives below the poverty line [59]
[11] Unsatisfied basic necessities are considered: 1) physically inadequate housing; 2) overcrowded housing; 3) lack of water or sanitation service; 4) households with children that do not attend school; and 5) households with high economic dependence (small proportion of household that is of working-age) [59].

42% agricultural and 2% commercial [19, 78]. The agricultural land that is being used for crop cultivation is mostly large private land-holdings that are worked by wage-labourers, the products of which are destined for the national markets. In 2005, the area of LC was producing approximately 25% of vegetables being consumed by the Metropolitan Lima population. Conversely, small-scale animal raising is a common activity among the poor landless families for the purpose of household consumption and supplemental income. Approximately 30-35% of poor landless households in LC were engaged in small scale animal raising in 2005 [79].

3.3.4 The communities of Nievería and Huachipa

Nievería and Huachipa were the two peri-urban communities within LC selected for this study due their high prevalence of poverty, malnutrition and UA activity. The district of LC is classified as low-income or poor; however many residents of Nievería and Huachipa live in extreme poverty [59]. There are no statistics for the rates of poverty, food security or child malnutrition for these specific communities; however, they are believed to be similar to or greater than the averages for the overall district of LC. The reason why these two particular communities may have worse poverty, food security and malnutrition is due to poorer infrastructure, fewer available amenities and services, and the fact that many residents are relatively new arrivals living in impermanent housing with few assets who are mostly involved in low-paying work and who lack social support networks [80].

UA has been reported as a common activity among households in these communities in a study carried out by the Nutrition Research Institute *(Instituto de Investigación Nutricional)* (IIN) in collaboration with the International Centre of the Potato *(Centro Internacional de la Papa)* (CIP) [75]. The study focused on families with young children, between the ages of 6 to 30 months, who engaged in some form of UA. Approximately 12% of these households possessed land for vegetable farming that was used predominantly for income generation. An estimated average of 71% of food

grown by these households was sold commercially to larger markets. Among all surveyed households, 47% raised livestock, 79% of which reared animals purely for consumption by the family, 7% used raised livestock for household consumption and for sale, and 41% reared livestock only for the purpose of selling [12].

3.3.5 Community kitchens

Households in Lima that regularly use community kitchens have lower food security levels and are generally poorer than those who do not [29]. Community kitchens in Lima are "survival organizations" that were originally formed by mothers in shanty-town areas during the height of the economic crisis in the early 1980s to provide affordable food for their families [31]. For more than three decades, community kitchens throughout Lima have serviced the poorest and most underprivileged members of the community [75, 81]. Today these organizations, which often cluster within new slum settlements where unemployment, poverty and food insecurity are extensive, number in thousands, providing many thousands of poor urban food insecure households with low-cost meals. The community kitchens in the study area have a long history of cooperation with collaborators at the IIN in Lima and have been very enthusiastic participants of nutrition education interventions and nutritional research in the past [77, 82].

3.3.6 Local research collaborators

This study contributed to the ongoing research on UA being carried out by researchers at the IIN and the Urban Harvest Project at CIP, both located in Lima. The IIN has worked among the poor urban population of Lima for many years through nutrition education and health promotion activities. Some nutrition behaviours that they have focused on are breastfeeding, complementary feeding of weanlings and improving dietary iron intakes [[75, 77, 82]. Since 1999, Urban Harvest investigators at CIP have been supporting

[12] Urban livestock consisted of mostly chickens, ducks, pigeons, pigs, goats and guinea pigs [60].

the development of UA and peri-urban agriculture (PUA) through research and training. Their studies have mainly been carried out in the Eastern Cone region where LC is situated [19, 78]. As described in Chapter 2, Urban Harvest researchers have yet to conduct a systematic evaluation of the relationship between UA and food security or nutrition related determinants and outcomes.

Definitions of UA are necessarily variable and situational, taking into account certain specific aspects of UA depending on the purpose of the investigation [4]. The definition for UA used for this study was established in coordination with the Urban Harvest team and follows this logic of context specificity and is described below.

3.4 Definition of urban agriculture

For the purposes of this study, UA was defined as engaging in the production of crops or raising livestock for the purpose of consumption by members of the household or household animals, which is situated on or close to the home plot, and is located within the municipal boundaries of the two study communities of Huachipa and Nievería.

In terms of livestock-rearing, the ownership and rearing of at least one animal, which was either itself or its by-products consumed or sold by the household was considered UA. Any animal considered a pet was not considered a product of UA. The raising of animals for sport, such as roosters for cockfighting, was also not considered UA.

In terms of cultivation, the study only considered the growing of food crops that could be used for human consumption or for feeding livestock as UA. This cultivation had to be carried out autonomously by the household, whereby the household was solely responsible for all the inputs and costs necessary to carry out the activity. As well, the products or income generated from the sale of the products had to be controlled and used only by the household interviewed. Thus we did not consider a family working as

agricultural labourers on large plots of outsourced land by a private company or business as UA.

Principal researchers decided before data collection began that the minimum quantity of crops grown or the minimum size of land dedicated to the growing of crops that would be considered UA would be determined iteratively[13] until 100% agreement was reached. The common activity of cultivating grass in Nievería would not be considered UA. This restriction was not found to be problematic however, as most cases in which a household may have been engaged in cultivating grass did so as wage-labourers and did not own the land.

Modalities of tenure/ usufruct, status of the site or official land use designation were not addressed in the definition of UA in this study.

3.5 Sample size calculations

3.5.1 Sample size for Hypothesis I

There were no previous studies found in which the impact of urban agriculture on food insecurity, malnutrition or poverty was statistically analyzed and compared to a control group. Therefore a search of the literature was conducted to locate comparable studies that analyzed the impact of coping activities used by poor households to improve their food security status, such as social feeding programs and poverty alleviation interventions. A few studies that made such comparisons were found, although these studies considered food security status as a dichotomous variable. One strategy to estimate sample size is to dichotomize the variable of interest [83]. This is appropriate for this study since household food security status is most often treated as a dichotomous rather than as a continuous variable. The chi-square statistic based on proportions can then be used to make a reasonable estimate of the sample size.

[13] This process involves researchers going back and forth between cases and shaping the criteria from what emerges until saturation - when no new cases emerge [89].

The proportion of the target population expected to be food insecure was estimated from published studies on the association between socioeconomic status and food security [27, 84]. In a validation study in Campinas, Brazil, Perez-Escamilla et al. found that nearly all (91.9%) households earning less than the minimum wage felt food insecure [84]. Therefore, it is reasonable to assume that 90% of households classified as poor or extremely poor in the target population would also feel food insecure.

Studies which have evaluated the impact of social feeding programs or poverty-alleviation interventions found that the prevalence of food insecurity levels was reduced between 33% and 50% [85, 86]. Assuming a more moderate effect of urban agriculture (UA) on food security than these other interventions, it is predicted that there will be a 20% difference in the prevalence of food insecurity between UA and non-UA households. Using a chi-square test comparing proportions, sample size was calculated using the following equation:

$$N = \frac{\{Z_\alpha \sqrt{[P(1-P)(1/q_1 + 1/q_2)]} + Z_\beta \sqrt{[P_1(1-P_1)(1/q_1) + P_2(1-P_2)(1/q_2)]}\}^2}{(P_1 - P_2)^2}$$

where

Desired precision: two-sided alpha (α) of 0.05

Desired power: 0.80, therefore a beta (β) of 0.20

Z_α = the standard normal deviate for α (If the alternative hypothesis is two-sided, $Z_\alpha = 1.96$ when $\alpha = 0.01$).

Z_β = the standard normal deviate for β ($Z_\beta = 0.84$ when $\beta = 0.20$).

q_1 = proportion of subjects in UA group (0.5)

q_2 = proportion of subjects in no-UA group (0.5)

N = total number of subjects

P_1=.90 P_2=.72

$P = q_1 P_1 + q_2 P_2$

From this equation we get a total of 163 subjects, 82 in UA group and 82 in no-UA group [83].

3.5.2 Sample size for Hypothesis II

Sample size for the hypothesis pertaining to anthropometric status was determined using information from Maxwell's study comparing UA and child nutritional status [16]. Estimated sample size was calculated as follows:

Effect size desired for the difference in height-for-age Z-scores between UA and non-UA groups: 0.2 height-for-age Z-score
Standard deviation from literature review: 0.5 Z-score
Calculated standard effect size (E/S) is therefore: effect size/standard deviation = 0.2/0.5 = 0.4
Desired precision: two-sided alpha (α) of 0.05
Desired power: 0.80, therefore a beta (β) of 0.20

Using a t-test comparing the means for continuous variables to estimate sample size we employ the following equation:

$N = [(1/q_1 + 1/q_2) S^2 (Z_\alpha + Z_\beta)^2] \div E^2$

where

Z_α = the standard normal deviate for α (If the alternative hypothesis is two-sided, $Z_\alpha = 1.96$ when $\alpha = 0.05$).

Z_β = the standard normal deviate for β ($Z_\beta = 0.84$ when $\beta = 0.20$).

q_1 = proportion of subjects in UA group (0.5)

q_2 = proportion of subjects in no-UA group (0.5)

S = standard deviation (0.5)

E = expected effect size (0.2)

N = total number of subjects required

From this equation we get a total of 196 subjects, 98 in UA group and 98 in no-UA group [83].

Taking into account both sample size calculations listed in sections 5.3.1 and 5.3.2, and using the larger value of the two, a sample size of 196 households was established for the study: 98 in the UA group and 98 in the non-UA group.

3.6 Ethics approval, permission and informed consent

Ethics approval was obtained prior to commencing fieldwork by the Research Ethics Board (REB) of the Faculty of Agricultural and Environmental Sciences of McGill University (Appendix A) and by the Institutional Review Board (IRB) of the IIN (Appendix B and C). Permission to carry out the study via the community kitchens was sought from the presidents of all participating community kitchen organizations (Appendix D). The purpose and procedures of the study were explained to the community kitchen leaders before requesting permission to recruit participants among their members. The leaders provided signatures for their consent.

All eligible community kitchen member households were explained clearly and thoroughly the purpose, procedures, benefits and risks of the study and sufficient time was provided to address questions and concerns to ensure genuine informed consent. Once it was felt that the participant clearly understood the nature of the study and their participation, written consent was obtained for their own participation as well as the participation of the preschool-aged child in their household. Caregivers who were not able to sign their name provided a thumbprint.

3.7 Recruitment

Low-income households were recruited into the study through their participation in the community kitchens located in Nievería and Huachipa. In 2003, there were approximately 20 community kitchens in Nievería, each comprising between 13 and 30 members [75]. These community kitchens served 40 to 150 rations per day depending on the number of members and operated between 7 am and 1 pm Monday to Friday. Among families sampled in a study by the IIN, 58% were community kitchen members, 80% of whom

participated everyday from Monday to Friday [75]. Because members of community kitchens tend to represent those individuals of the lowest socioeconomic status group in their communities, they possess many similarities in terms of economic circumstance, education level, forms of employment, availability of resources, access to basic services and use of informal safety nets [31, 81, 87, 88].

3.7.1 Methods of recruitment and selection

Community kitchens

The very first step in the process of recruiting community kitchens was to carry out a census of all community kitchens in the two study areas. A registry of all the community kitchens for the whole district of LC was obtained from the office of the municipality which provided the name, address, name of the president, number of participants, type of support and resources of each community kitchen. With the register in hand, the research team set out to locate all community kitchens. Through this process, the research team was able to update the registry, as some of the listed community kitchens were no longer in existence while new ones had formed. In addition to the information detailed in the registry, the census gathered information on the number of community kitchen members who were caregivers of preschool-aged children and their contact information.

All community kitchens located within Nievería and Huachipa were recruited for inclusion into the study (Figure 3.4). Only one community kitchen was not included because none of the members were caregivers of a preschool-aged child[14]. Recruitment of community kitchens and its member households first started in Nievería. After having recruited all community kitchens and eligible households within Nievería, it was found that the sample size had not yet been obtained. Thus recruitment expanded into the neighboring community of Huachipa to enroll additional participants. In total,

[14] Members of this particular kitchen only had older-aged children living in their households or only lived with their spouses.

41 community kitchens participated in the study, 23 from Nievería and 18 from Huachipa.

Justification for expansion into Huachipa

The selection of Huachipa for inclusion into the study was justified due the following:

- its geographical proximity to Nievería;
- similar socioeconomic and demographic characteristics of households, i.e.: mothers and fathers of households work in paid labour, often in brick building or in the fields; households lack basic services such as hygienic sanitation facilities and electricity;
- both communities have populated centres;
- similar access to food and markets;
- similar concentration of community kitchens; and
- similar prevalence of UA activity

Members of the community kitchens

Community kitchen members who met the selection criteria and consented to participate were included in the study. If more than one member of the community kitchen was from the same household and within that household jointly cared for the same child, only the main caregiver of the child was interviewed.

Children within households selected into the study

If the participant was the main caregiver for more than one child who met eligibility criteria, the youngest of these children was included in the study. If there were two pre-school aged children within the household of the same age, then both of their names were written on a piece of paper and put into a hat and randomly drawn out to select which child would participate.

3.7.2 Eligibility criteria

Inclusion criteria for households:

i) Criteria for inclusion of all households into the sample selection were:
   1) Must reside on a consistent-basis in the peri-urban zone of Nievería or Huachipa;
   2) Must participate in a selected community kitchen in Nievería or Huachipa;
   3) Must have at least one preschool-aged child (9-71 months old);
   4) Must have resided within Nievería or Huachipa for a minimum of 1 year[15].

ii) Criteria for inclusion of households into the UA group:
   Must have a minimum area dedicated to the growing of crops or a minimum number of livestock being raised on their households plots for the purpose of human consumption.

iii) Criteria for inclusion of households into the no-UA group:
   If did not meet the inclusion criteria for incorporation into the UA group they were included into the no-UA group.

Exclusion criteria for households:

i) Criteria for exclusion for all households from the study sample were:
   If the preschool-aged child within the household has a medical condition that could have interrupted normal feeding and growth.

3.8 Data collection

Data collection in the field began in September 2007 and continued until April 2008. The field research team responsible for the field data collection was made up of a six people: the principal researcher and McGill graduate student who designed and coordinated the study, a team-coordinator who was

[15] In order that all households had sufficient time to engage in UA if they had so desired.

a nutritionist from the IIN, two paid field workers – one who carried out interviews and another that was responsible for recruitment of participants, and two university nutrition student interns– one worked as an interviewer and the other worked as an aid in recruitment and in office work.

3.8.1 Preliminary work

Interviews with CIP agricultural extension workers and with IIN researchers were carried out prior to data collection to design appropriate data collection tools and to create context-specific definitions for urban agriculture. Field staff underwent training and standardization in data collection techniques both at the IIN and in the field. Testing of data collection tools was carried out through interviews with women from other communities that were similar to Nievería and Huachipa.

3.8.2 Fieldwork

i) Main sample

To collect both quantitative and qualitative data, households were visited on at least two occasions at a pre-arranged date and time. Households were revisited until the respondent was located. The respondent for the household was the main caregiver of the preschool-aged child and most often the main person in charge of food preparation. Data were gathered through the administration of pre-tested surveys and questionnaires as described below in Figure 3.3.

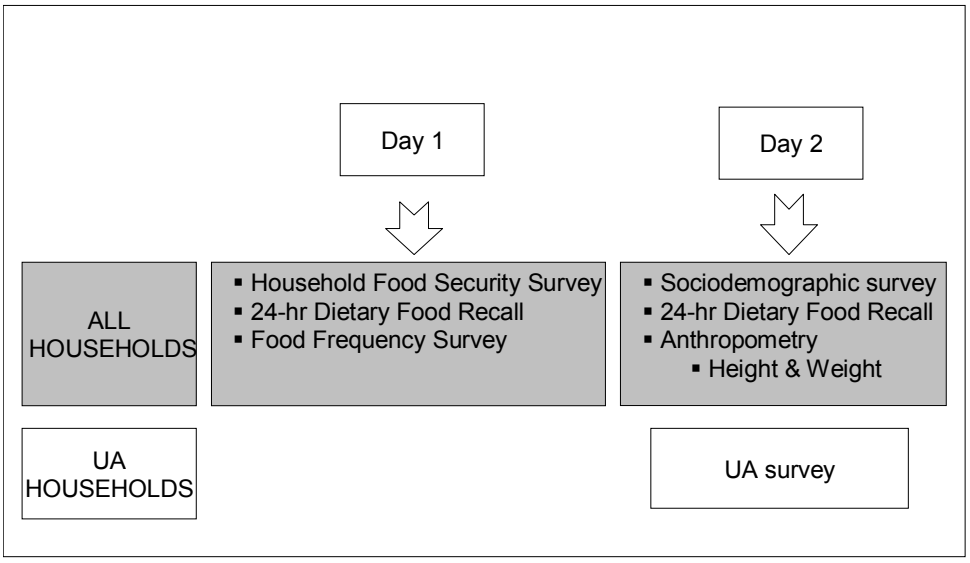


Figure 3.3 Flow of data collection over two days

ii) Sub-sample

Some participants within the UA group were invited to participate in a separate sub-sample for which they had a third visit for an in-depth semi-structured interview. Detailed qualitative data were collected about their experiences, perceptions and feelings concerning their engagement in UA. In these sessions information was also gathered on maternal workload, life histories and gender roles.

Purposeful sampling methods were employed to recruit households for this sub-sample. These included both maximum variation and snowball sampling. Maximum variation sampling involves identifying and seeking out those participants that represent the widest possible range of characteristics of interest for the study [89]. For the sub-sample, maximum variation was used to enroll UA households that varied widely in their UA practices. In doing so, common patterns could emerge despite the great variation. This is important in describing "the core experiences and central, shared dimensions of" urban agriculture in this setting [89]. The variation in UA that was sought was in the size or amount of UA household activity, the types of crops being grown or animals being raised and in the uses of UA by the households.

Snowball sampling entails asking participants in the study to refer the researcher to other key-informants that may be information-rich cases of the phenomena of interest (UA in this case) [89]. By employing this method, we were able to locate good interview subjects that illuminated important characteristics of UA for this study. The use of snowball sampling led to the incorporation of some women from low-income households within these same communities who were not currently active members of the community kitchens. Albeit they differed slightly from the women in our study in that they did not use the community kitchens as sources of food, they were sufficiently similar and therefore their insight was valuable to understand the dimensions of UA engagement in these communities.

3.8.3 Data collection tools

a) Sociodemographic survey (Appendix E)
b) Urban agriculture survey (Appendix F)
c) Household food security survey (Appendix G)
d) Food frequency questionnaire (Appendix H)
e) Semi-structured interview protocol employing open-ended questioning to collect in-depth qualitative information on UA practices, life histories, maternal workload and gender roles within the household and within UA engagement.

3.8.4 Quantitative information

i) Urban agriculture

The urban agriculture survey (Appendix F) was designed to quantify UA practices among survey respondents. From this questionnaire information was gathered on the quantity and the variety of animals being raised and/or food crops being cultivated; the specific animals and/or crops most used for the purpose of household consumption vs. for commercial sale and income generation; the amount and kinds of resources necessary for this activity; the amount of money allocated to UA; the length of time the household has been engaged in UA; the number of household members involved and the main

persons responsible for household UA activities; and the main benefit of engaging in UA for the respondent.

ii) Socioeconomic, demographic and health information

The sociodemographic questionnaire collected information on parental, household and child characteristics that impact household food security and child nutritional status. This included:

- the education, employment and origins of both mother and father
- the number of household members and crowding
- household building materials, water and sanitation facilities
- material assets and weekly food expenditure
- the age[16], sex, birth weight and current health status[17] of the index child
- maternal care practices for the index child
- use of/reliance on social programs, such as Glass of Milk
- household decision making
- social capital[18], and
- nutrition knowledge[19]

iii) Adequacy of the diet, feeding behaviours and food purchasing habits

Food frequency questionnaire

The twenty-item food frequency questionnaire was designed to incorporate high-value perishable products, such as vegetables high in lutein and beta-carotene and animal source foods high in iron and zinc, which are

[16] Dates of birth for the preschool-aged children in the study were verified when possible using health cards.
[17] Caregivers will be asked to describe the health status of the index child over the last week and any major illnesses and/or hospitalizations.
[18] Social capital questions addressed existence and use of local community development programs and social support organizations, the availability and use of monetary loans and credit, as well as trust and support of neighbors and the community. These questions were adapted from those used in the Young Lives Project [90].
[19] Nutrition knowledge questions previously employed by the IIN in nutrition education interventions in Nievería were used [60].

commonly consumed in the diet in this population. The questionnaire was designed to record each time a child was offered a particular food item, however each instance did not represent a standard portion size and provided no information on exact quantities. Information on food purchasing habits, such as where foods were most often acquired, as well as which foods consumed by the child was home-produced was also provided by the food frequency questionnaire [20,21].

iv) Anthropometric data

Weight, height and length measures were taken for preschool-aged children for all households in the study following WHO standard anthropometric techniques [90] using an electronic Soehnle (Bracknang, Germany) scale with a precision of 100 g. Shoes and as much outer clothing as possible was removed to get as close to the real weight of the child as possible. When weighing the mother and/or child, the scale was placed on the ground on an even surface. Children who were able to stand alone were weighed standing on the scale. Otherwise, the mother and child were weighed together and then the mother was weighed alone. To get the child's weight the mother's weight was subtracted from the weight of the mother and child together (tared weighing).

A locally made height board or stadiometer with a precision of 0.1 cm, consisting of a baseboard and an adjustable headboard, was provided by the IIN. The stadiometer was mounted at a right angle between a level floor and against a straight, vertical surface such as a wall or pillar. Heights of children were taken while children were standing if they were 2 years of age or older. If children were less than 2 years of age, their length was measured while they were recumbent on the stadiometer, with their head at the base of the

[20] Two 24-hour dietary recalls were also carried out during visits with caregivers. The data collected using these instruments provided more detailed information of the diet of the index child, however this information will not be included in this thesis.

[21] Milk not included in the food frequency questionnaire due to high overall consumption in the population and due to wide-spread participation in the Glass of Milk Programme

stadiometer and using the headboard as a footboard. Repeated measures were not taken.

v) Food security

The household food security survey (Appendix G) used in this study was a version of the USDA Household Food Security Scale Module (HFSSM) that was adapted, translated and validated for use among the Peruvian population [29]. The survey consisted of 24 questions in total: the first 16 represented the "core set" of questions used by the USDA HFSSM to calculate the scale; the next four asked direct questions about household food availability and food coping strategies; and the final four questions corresponded to household access and use of food assistance programs. The last three questions were modified slightly, asking about access and use of the Glass of Milk Program [29].

3.8.5 Qualitative information

Qualitative research methods were employed in the study to illuminate the characteristics, benefits and barriers to UA activities. Respondents were asked which household member decides how resources derived from UA are allocated; what are the attitudes of the different members of the household toward UA; what are the perceived rewards and/or benefits of engaging in UA; why the household first became involved in UA; how engaging in UA has impacted on the household in different ways; and how has UA helped in terms of food security from the point of view of the caregiver responsible for feeding the household. This information was able to give important context as to the purpose of UA engagement within this population and illuminated ways in which UA could be supported or enhanced to improve food security and child malnutrition at the household and community levels.

3.9 Data entry

Answers from the sociodemographic, food frequency questionnaire, household food security survey, urban agriculture survey and anthropometric results were entered using Microsoft Access 2002. Qualitative interviews were recorded, downloaded using Olympus Digital Wave Player and manually transcribed.

3.10 Data analysis

Statistical analysis was executed using Statistical Analysis Software (SAS 9.1.3) for Windows (SAS Institute, Cary, NC, USA). Statistical analysis was carried out in such a ways as to demonstrate the *a priori* relationships specified in the conceptual framework (Figure 3.1).

3.10.1 Dependent variables

The dependent variables that were examined in the analysis were: the household food security score, treated as both a continuous and a categorical variable; the anthropometrical results for the preschool-aged children, particularly height-for-age Z-scores and the frequency of consumption of ASF by the child during the previous week.

Food security status

Following the USDA Guide to Measuring Food Security [21], selected questions from the food security survey were itemized for the purpose of evaluation (Appendix I). Items 1 and 2 were related to anxiety or perception that the household food budget or supply was insufficient or inadequate; items 3, 4 and 5 were related to perceptions that food eaten by adults and/or children was inadequate in quality; items 7 to 11 were related to reported circumstances where adults had to reduce food intake and/or its consequences, and items 6 and 12 to 18 were related to situations where children had to reduce food intake and/or its consequences.

The total number of affirmative responses for items 1-18 were summed for each participant[22] and that total was converted to a food security scale value ranging from 0 to 10 using the USDA food security guide conversion table [23] [21] (Appendix J). The state of being fully food secure, when all items have received a negative response, was assigned a scale value of zero. The most severe state of food insecurity, in which all 18 survey items were responded to affirmatively, was assigned a scale value approaching ten.

The food security scale was analyzed as both a quantitative continuous and as an ordinal categorical variable. When treated as a continuous variable, the scale facilitated the use of correlation analysis. When treated as an ordinal variable, thresholds established by the USDA[24] were used to create ranges of severity, thereby classifying household as either being *food secure*, being *marginally food secure*, having *low food security* or having *very low food security* (Figure 3.4) [21, 91]. The thresholds for food security was a score from 0 to 2.32, for marginal food security was 2.33 to 4.56, for low food security was 4.57 to 6.53, and very low food security was 6.53 or above. Using this approach, food security was looked at as either a binomial or multinomial variable and allowed for an analysis of the differences in proportions between groups (Chi-square tests) and cumulative logistic regression.

[22] Items with missing values were given a value using the method suggested by the USDA Guide to Measuring Household Food Security [29] and using their list of severity, which is considered conservative.

[23] The statistical procedure that determines a household's scale value is complex, depending on the number of increasingly severe signs of food insecurity that the household has experienced, specified by affirmative responses to the increasingly severe order of survey questions [25]. See appendix J for table of standard values estimated for US population from CPS food security data.

[24] Food secure from 0 to 2.32, food insecure without hunger from 2.33 to 4.56, food insecure with moderate hunger 4.57 to 6.53, and food insecure with sever hunger above 6.53.

Thresholds	Levels of food security[25]
0 – 2.32	**Level 1: Food secure** **Defined as:** Households demonstrating no or negligible food insecurity.
2.33 – 4.56	**Level 2: Marginally food secure** **Defined as:** Household members' concerns about sufficiency of the household food supply and in implementation of household food coping strategies, including diminished quality of food shows confirmation of some food insecurity. However members are not yet reporting decreased food intake (or reporting only very little).
4.57 – 6.53	**Level 3: Low food security** **Defined as:** Adult members of the household are reducing food intake to a point where they have frequently experienced the physical sensation of hunger. However, in the case of households with children, this reduced food intake and subsequent feeling of hunger have yet to occur among the children.
> 6.53	**Level 4: Very low food security** **Defined as:** At this level, all household members, even children, have to reduce their food intake to a point in which they are experiencing the physical sensation of hunger; (Some households with children could have already had this occur at an earlier stage of severity). Adults in households with and without children have frequently experienced more significant reductions in food intake at this level of severity.

(Bickel,USDA,2000)

Figure 3.4: Levels of food security and definitions adapted from USDA Guide for Measuring Household Food Security Revised (2000)

Animal source foods

From the food frequency questionnaire, the number of times the index child was served a particular food item from the questionnaire during the previous seven days was determined. All animal source food (ASF) items of the food frequency questionnaire were combined to provide information on the number of times the index child was served an ASF. This process was repeated for subdivision of ASF, for all vegetables, for all green leafy vegetables and for beans and lentils.

HAZ and stunting

Height-for-age Z-scores of children were determined from anthropometric measurements using the WHO Anthro v2.0.2 for children less

[25] New labels that no longer use the term "hunger" established in 2006 by the Committee on National Statistics of the National Academies at the request of the USDA. Though new labels used, methods to assess household's food security remain unchanged [91].

than 60 months of age, and using EpiInfo Nutstat 2004 for children 60 to 71 months of age. HAZ was analyzed as a quantitative continuous variable and the means compared between different groups and classifications using Student's t-tests, one-way Analysis of Variance (ANOVA) and linear regression. A binomial stunting variable was created (indicating those children with HAZ < -2 SD) and the proportion of stunted children within different groups and classifications were analyzed using a Chi-square test of proportions and logistic regression.

3.10.2 Independent variables

Predictor variable: urban agriculture

The first step in analyzing UA activity was to develop a dichotomous variable (UA present or UA not present) for households based on our definition of UA. Most UA households surveyed (96%, n=87) only engaged in animal raising and not in the cultivation of crops; the remaining 4% (N=4) did a combination of both animal-raising and crop cultivation. The treatment variable was defined as either the presence or absence of the raising of livestock. A dichotomous variable was also created to account for the influence of crop cultivation on outcome variables.

UA activity in relation to animal raising was monetarized to provide a continuous variable for correlation analysis and for further stratification of UA households (Appendix L). The UA survey provided the number of each type of livestock being raised by UA households. Each different type of livestock was given an estimated value based on the current market prices [92]. The number of units of a particular animal being raised by a household was multiplied by its corresponding monetary value and the product value for each type of animal was summed to give a total UA value. The majority of UA households reared only a small quantity of small-sized livestock (chickens and guinea pigs), while a minor proportion raised a larger quantity of animals of bigger livestock with a greater market value (e.g. pigs). Based on these observations, UA activity was stratified into small, medium and large

categories corresponding to less than the 50th, between the 50th and 75th percentiles, and above the 75th percentile, respectively.

Other explanatory variables

Other explanatory variables considered in the statistical analysis were socioeconomic and demographic factors such as child characteristics (child birth weight, number of symptoms of illness displayed during the previous week); parental characteristics (maternal height, education and occupation, and paternal education, occupation and current work status); and housing characteristics (household material assets, weekly food expenditure, number of rooms occupied and the number of persons residing in the household, water, sanitation and household building materials). Some of the categories of the different factors were collapsed or grouped together if it was found that these categories were very similar in their effect on the response variables.

3.10.3 Descriptive univariate and bivariate analyses

Descriptive univariate analysis was performed by calculating means, medians, standard deviations, and ranges for all quantitative continuous variables, and proportions for all categorical variables. Simple bivariate analysis was carried out between all normally-distributed continuous variables using either a Student's t-test, one-way ANOVA, or Pearson's product-moment correlation. For continuous variables that were not normally distributed, the Wilcoxon or Kruskal-Wallis non-parametric test, or Spearman's rank-order correlation was performed. For tests of proportions, either a Chi-square or a Fisher's Exact Tests was used where appropriate.

3.10.4 Adjusted regression analyses

Outcome variables were fitted into either linear or logistic regression models depending on whether the outcome variable was a continuous or a categorical variable. In both cases, to take into account the variation associated with random clustering from our sampling frame, a random effects model was used during regression analysis. In this model, community kitchens

nested within the two communities were treated as a random effect. PROC MIXED was used for both HAZ and ASF outcome variables. PROC GLIMMIX was used for the food security outcome variable.

In PROC GLIMMIX, food security was treated as a multinomial categorical outcome variable and the reference category was set as the first level (which is being food secure); the other three levels reflect increasing food insecurity (Appendix K). Both PROC MIXED and PROC GLIMMIX allow for random effects. Step-wise elimination was used to test for the significance of the fixed effects included in the models. All variables with a minimum significance of $p < 0.25$ were kept in the models. The variable for the community of residence of participants was kept in all models regardless of its significance due to its mandatory incorporation into the random effects variable. The R-square value was not used in the process because it is not provided with either PROC MIXED or PROC GLIMMIX procedures. Before models were finalized, collinearity was checked by examining a matrix of bivariate correlations for all continuous variables included in the model. The following tables exhibit explanatory variables included in the final models for the three outcome variables: severity of food insecurity, frequency of consumption of ASF, and children's HAZ.

Table 3.1: Candidate predictors of outcome variables considered during regression analysis

Demographic variables	Socioeconomic variables
– Community of residence	– Household material assets
– Urban agriculture scale	– House wall material
– Maternal length of residence	– House water source
– Maternal education level	– Father steadily employed
– Parity of caregiver	– Nuclear family owns home vs. lives with extended family or rents
– Paternal education level	– Weekly food expenditure per household member
– Paternal length of residence	– Number of household members per room
– Use of Glass of Milk Program	
– Child birth weight	

3.11 Timeline

Table 3.2: Timeline of activities for field research

	June '07	July '07	Aug '07	Sep '07 – Feb '08	Mar '08	April '08 – Sep '08
Design of survey tools and interview protocols	✓					
Ethics Approvals	✓	✓				
Travel to Peru		✓				
Connections with collaborators and training in data collection techniques		✓				
Field testing of data collection tools			✓			
Data collection and entry				✓		
Return to McGill					✓	
Cleaning and analysis of data						✓

4. RESULTS

4.1 Community kitchens

We located 24 community kitchens in Nievería and 18 community kitchens in Huachipa. All but two of the 42 community kitchens entered into the study (Figure 4.1); one had no members with preschool-aged children, for the other community kitchen the only eligible member dropped out before completing the study. The number of members participating in each community kitchen ranged between 13 and 24 (19 ± 3). About one third of the 792 members (n = 264) were caregivers of a preschool-aged child and had lived in the community for at least 1 year. Of these 264 women, the research team was able to locate 242 for recruitment and 228 members agreed to participate in the study. After enrollment, 31 women were not located or no longer wanted to participate and were not included in the analysis, leaving a total of 197 participants in 40 community kitchens who completed all visits. Study acceptance rate among all eligible community kitchen members who were located was 81%.

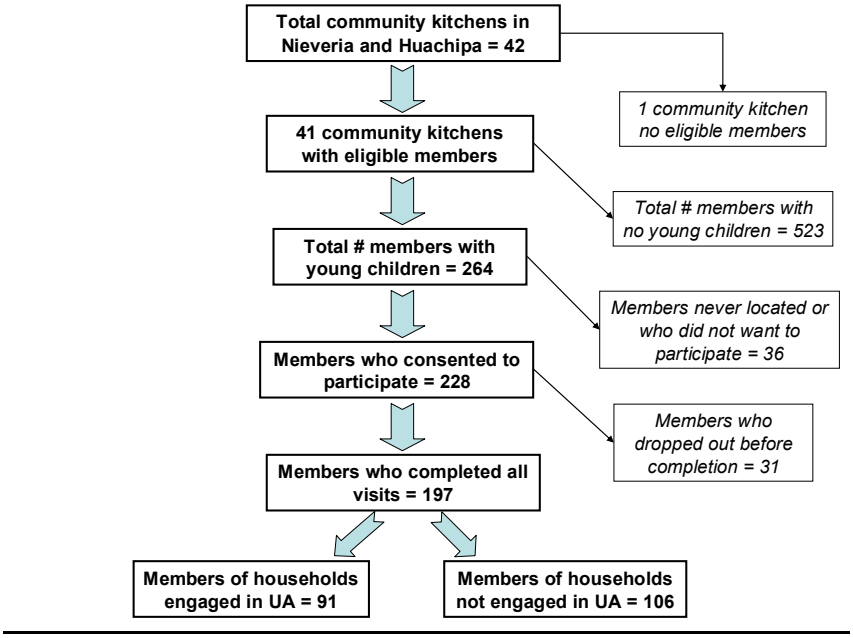


Figure 4.1 Flow of recruitment of community kitchen members in two peri-urban communities of Lima, Peru

4.2 Urban agriculture activities in Nievería and Huachipa

Almost half (46%, n = 91) of all participating households in both study site communities were engaged in UA at the time of the survey. Over 96% of these households were exclusively engaged in small-scale animal-raising; 4% combined small-scale animal raising and crop cultivation. There was great diversity in the scale of UA activity (Table 4.1), such as in the number of animal units being raised per household (1- 92 units), the total monetary value of the UA activity (US $5 - $3216), the cost of inputs (US$1 - $254 per month) and the range of time involved in current UA activities (1 month up to 48 years). When UA households were subdivided into three groups based on size of monetary UA value, additional group differences in the activity became more apparent (Table 4.1). A substantially greater proportion of households in the Large UA group had been involved in raising animals for two years or more compared to the Small and Medium UA groups. Regression analysis also confirmed this trend of greater time involved in UA being significantly associated with a higher UA value ($r = 0.46$, $p < 0.0001$).

In terms of keeping of livestock, the most commonly raised animal for all UA households was poultry (Figure 4.2) which was raised mostly for household consumption and not for commercial sale. The second most common animals were pigs (Figure 4.2), which was mostly raised for the purpose of selling and generating supplemental income. As seen in Table 4.1, households in the Medium and Large UA groups engaged much more in pig farming than Small UA households ($p < 0.0001$). Only two households of the Small UA group had recently sold some of their animals for surplus income and in these instances they were guinea pigs rather than poultry. None of the households in any of the three UA groups ever considered selling their poultry to generate income. While about half of the households in the Medium and Large UA groups said the poultry they produced was regularly consumed within the household, this proportion rose to over 75% in the Small UA group.

Table 4.1.: Characteristics of farming activity among households engaged in small, medium and large scale urban agriculture in a peri-urban low-income community of Lima, Peru[1]

Characteristics	Scale of urban agriculture			p-value[2]
	Small UA (N = 42)	Medium UA (N = 26)	Large UA (N = 23)	
Time involved				
< 2 y	57% (N=24)	48% (N=12)	17% (N=4)	0.02
2 – 10 y	31% (N=13)	32% (N=8)	65% (N=15)	
≥ 10 y	12% (N=5)	20% (N=5)	17% (N = 4)	
Type of livestock				
Guinea pigs	21% (N=9)	8% (N=2)	4% (N=1)	0.12
Poultry[3]	69% (N=29)	48% (N=12)	56% (N=13)	0.22
Pigs	2% (N=1)	68% (N=17)	87% (N=20)	<0.0001
US$ spent on animals per month[4]	3 – 102	6 – 202	30-740	
Food security reason for engagement	90% (N=38)	44% (N=11)	44% (N=10)	<0.0001

[1] Data are presented as % (N) or ranges; [2] Data for this table were tested for significant differences using Chi-square and Fisher's Exact Test when appropriate; [3] – Poultry includes only hens and chickens; [4] Expressed in New Peruvian Soles (PEN) ($1US=2.91PEN)

Overall, the reason most cited for engaging in UA was better food security (Figure 4.3) (67%, n = 59). There was again great diversity between UA groups in the reported main reason for engaging, or the main benefit of engaging in UA (Table 4.1). While 90% of respondents in the Small UA group cited better food security as the main reason for engaging in UA, this percentage was significantly decreased to less than half of respondents in both the Medium and Large UA groups ($p < 0.0001$). Except for a few cases, the female caregiver of the index child was the main person responsible for UA activities of the household and this was the same across all three UA group sizes. If the father of the index child or the male head of the household were involved, this most often involved acquiring same across all three UA group sizes. If the father of the index child or the male head of the household were involved, this most often involved acquiring the animals and/or buying inputs. All other tasks were the mainly the responsibility of the female caregiver.

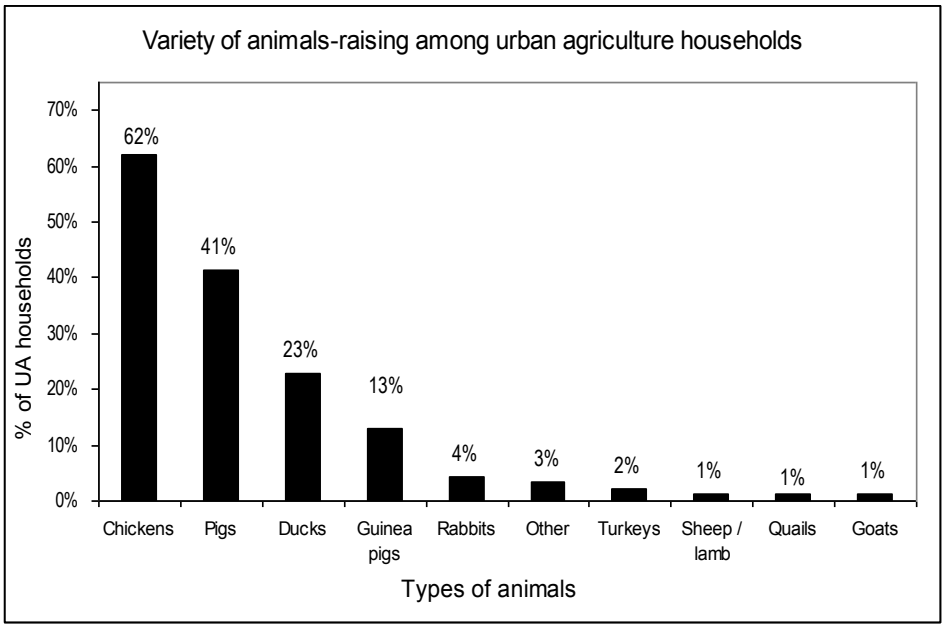


Figure 4.2: Varieties of animals being raised among low-income peri-urban households of Lima, Peru

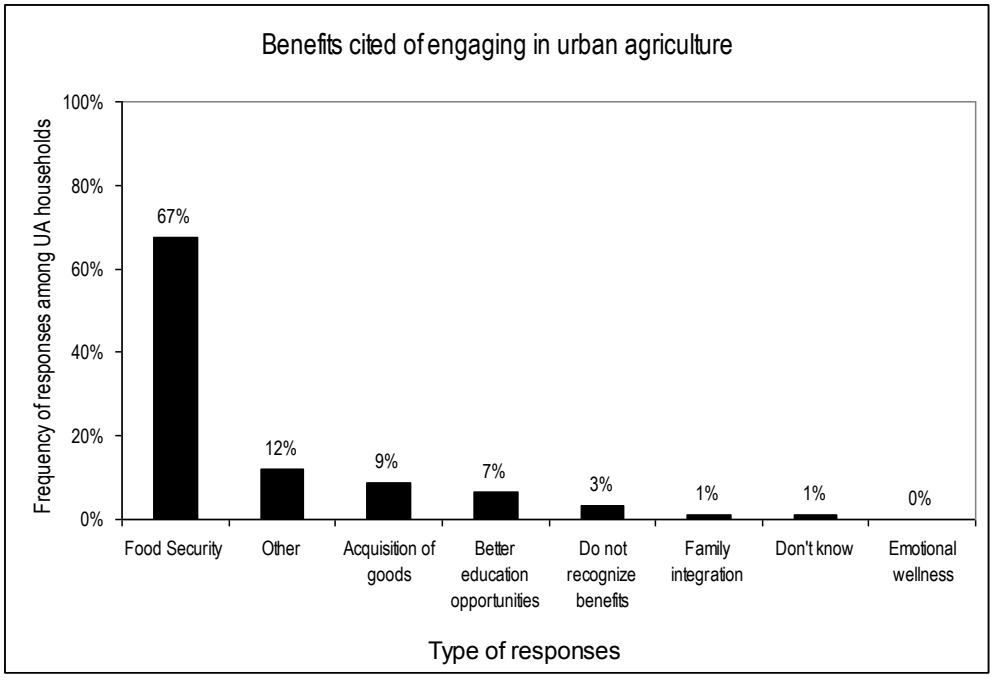


Figure 4.3: Benefits cited of engaging in UA among low-income peri-urban households of Lima, Peru

4.3 Socioeconomic and demographic characteristics

In the study sites most homes were poorly constructed, consisting of dirt floors (55%) and walls composed of semi-permanent materials such as adobe or unfinished brick (69%) (Table 4.2). A small proportion of poorer homes (7%, n = 13) were shacks constructed simply of weaved straw or wooden boards. Most households had access to an initially clean and safe source of drinking water (73%, n = 144); however, in most cases (n = 109) this was not a home connection and many households stored their drinking water in large plastic cylinders without a faucet, making it very susceptible to post-source contamination. More than one fifth (n = 44) of households had no sanitation facility within or attached to their homes and had to resort to the use of ditches, hillsides or garbage dumps for human waste disposal. Nearly half of households consisted of extended family (43%) and was fairly crowded, with an average size of 6 persons. Most households (86%) owned very few material assets which most often consisted of a radio, television, cell phone or blender. Average weekly household food expenditure US $36 ± $18. During qualitative interviews (results reported elsewhere) caregivers stated that single-income households in the study site communities earned roughly US $180 per month. Thus, among nuclear households approximately 80% of monthly earnings were used just to provide food for the household.

Further analysis by UA group revealed important differences in household socioeconomic variables (Table 4.2). In general, households in the Large UA group tended to have better living conditions than the Small and Medium UA groups but not compared to the No UA group. This was seen in the wall building materials, available sanitation facilities, household crowding and the presence of extended family members.

Table 4.2: Characteristics of 197 low-income peri-urban households with preschool-aged children (9-71 mo) of Lima, Peru by category of urban agriculture activity [1]

Household characteristics Total *N* = 197	ALL		No UA *N* = 106		Scale of urban agriculture						p-value[2]
					Small *N* = 42		Medium *N* = 26		Large *N* = 23		
Community of residence											
Nievería	68.0	(134)	67.9	(72)	71.4	(30)	57.7	(15)	73.9	(17)	0.60
Huachipa	32.0	(63)	32.1	(34)	28.6	(12)	42.3	(11)	26.1	(6)	
Water source for drinking /cooking:											
Unreliable/unclean source[3]	26.9	(53)	22.6	(24)	38.1	(16)	34.6	(9)	17.4	(4)	0.09
Cistern truck[4]	35.5	(70)	39.6	(42)	33.3	(14)	30.8	(8)	26.1	(6)	
Public pump	19.8	(39)	17.0	(18)	21.4	(9)	26.9	(7)	21.7	(5)	
Reliable potable home connection	17.8	(35)	20.8	(22)	7.1	(3)	7.7	(2)	34.8	(8)	
Sanitation facilities:											
No facility[5]	22.3	(44)	28.3	(30)	19.0	(8)	7.7	(2)	17.4	(4)	0.03
Facility without drainage[6]	64.5	(127)	59.4	(63)	71.4	(30)	84.6	(22)	52.2	(12)	
Facility with drainage[7]	13.2	(26)	12.3	(13)	9.5	(4)	7.7	(2)	30.4	(7)	
Floor materials:											
Dirt	55.3	(109)	53.8	(57)	57.1	(24)	61.5	(16)	52.2	(12)	0.88
Unfinished/finished cement	38.1	(75)	46.2	(49)	42.9	(18)	38.5	(10)	47.8	(11)	
Wall materials:											
Non-permanent[8]	14.2	(27)	18.6	(19)	17.1	(7)	4.0	(1)	0.0	(0)	0.04
Semi-permanent[9] / Permanent[10]	85.8	(163)	81.4	(83)	82.9	(34)	96.0	(24)	100.0	(22)	
Cooking fuel source:											
Gas	82.7	(163)	85.8	(91)	69.0	(29)	88.5	(23)	87.0	(20)	0.10
Other[11]	17.3	(34)	14.2	(15)	31.0	(13)	11.5	(3)	13.0	(3)	
Live w/ extended family	42.6	(84)	47.2	(50)	21.4	(9)	50.0	(13)	52.2	(12)	0.02

Own home of residence [12]	40.1 (79)	34.0 (36)	52.4 (22)	42.3 (11)	43.5 (10)	0.22
Rooms in home, #	3.1 ± 1.6	2.9 ± 1.6	3.0 ± 1.2	3.8 ± 2.0	3.4 ± 1.4	0.08
Members of household, #	6.1 ± 2.7	6.3 ± 2.8	6.0 ± 2.6	6.3 ± 3.2	5.8 ± 1.9	0.95
Members per room [13], #	2.5 ± 2.0	2.7 ± 1.7	2.3 ± 1.3	2.0 ± 1.5	1.9 ± 1.0	0.04
Household material assets [14]:						
Total assets, #	3.6 ± 1.6	3.6 ± 1.9	3.4 ± 1.4	3.6 ± 1.3	3.8 ± 1.2	0.71
Proportion of households with:						
0-2 Assets, #	23.9 (47)	31.1 (33)	23.8 (10)	19.2 (5)	8.7 (2)	0.12
3-5 Assets, #	61.9 (122)	52.8 (56)	69.0 (29)	69.2 (18)	82.6 (19)	
≥6 Assets, #	12.7 (25)	16.0 (17)	7.1 (3)	11.5 (3)	8.7 (2)	
Total weekly household food expenditure [15], *soles/wk*	103.3 ± 53.3	100.8 ± 56.4	104.7 ± 52.8	102.4 ± 29.8	113.3 ± 61.4	0.65
Weekly food expenditure per household member [15], *soles/wk*	19.8 ± 11.2	19.1 ± 11.7	20.6 ± 10.5	19.0 ± 7.8	22.4 ± 13.7	0.57
Participate in Glass of Milk program	40.6 (80)	45.2 (19)	42.3 (11)	39.1 (9)	38.7 (41)	0.90

[1] Data are presented as mean ± SD or % (N); [2] Data for this table were tested for significant differences using one-way ANOVA, Kruskal-Wallis non-parametric test, Chi-square and Fisher's Exact Test when appropriate; [3] Ground wells, rivers/streams or "other"; [4] Imported potable water; [5] Do necessities in field, hillsides or garbage dumps; [6] Latrines or septic tanks without drainage; [7] Latrines with drainage, toilet with water drainage or ecological toilet; [8] Straw/mat, cardboard, loose brick, wood, other; [9] Adobe; [10] Unfinished brick, finished brick or cement; [11] Includes coal, kerosene, firewood or "other"; [12] Own home vs. rent home or living in home of extended family; [13] Total # of household members by total # of rooms in the home; [14] Out of a possible total of 10 resources including: radio, speakers, television, cell/phone, blender, bicycle, motorcycle/scooter/car, refrigerator, sewing machine, washing machine; [15] Expressed in New Peruvian Soles (PEN) ($1US=2.91PEN)

Most households were two parent households (n = 178); only eight households were female-headed. Most parents had at least completed primary school (Tables 4.3 and 4.4); very few had never attended school. More than half of caregivers were housewives (n=116). However, many were employed as labourers in construction or agriculture or were engaged in informal work outside the home, usually as vendors in the street or in informal markets (Table 4.3). Fathers were most often engaged in informal work, either as unskilled labourers (43%) or as drivers of taxis or public transport buses (16%) (Table 4.4). A greater proportion of fathers of the No UA and Large UA households had more skilled and formal forms of employment than fathers of the Small and Medium UA households ($p < 0.003$), but no significant differences were observed in the rate of employment of fathers between groups. While almost all fathers had some form of employment (94%, n = 166), most were under-employed, with less than a third employed in steady regular paying jobs (32%, n = 56).

Almost two-thirds of all caregivers had originated from the rural highland region of the country (n=121), and had lived in the area approximately 12 ± 9 years (Table 4.3). These two variables showed the most pronounced differences between UA versus No UA households, and between No UA, Small, Medium and Large UA groups. In general, as UA activity increased across groups, the more likely the parents of the index child was originally from Lima and had resided in their communities for more time (Table 4.3 and 4.4). Length of residence of caregivers and fathers were approximately 1.5 and 2.0 times greater (respectively) among the Medium and Large UA groups compared to the No UA and Small UA groups (caregivers: $p < 0.0002$; fathers: $p < 0.01$). Maternal and paternal length of residence were significantly correlated ($r = 0.44$, $p < 0.0001$).

Table 4.3: Characteristics of 197 female caregivers of with preschool-aged children (9-71 mo) of low-income peri-urban households in Lima, Peru, by category of urban agriculture activity[1]

Caregiver characteristics	ALL	No UA *N* = 106	Scale of urban agriculture			p-value[2]
			Small *N* = 42	Medium *N* = 26	Large *N* = 23	
Age of caregiver, *y*	30.1 ± 7.6	29.0 ± 7.4	32.1 ± 7.8	30.3 ± 8.6	31.2 ± 6.6	0.13
Length of residence of caregiver, *y*	12.4 ± 9.1	10.1 ± 7.9 [a]	12.8 ± 9.3 [a,b]	18.5 ± 10.3 [b]	15.9 ± 9.3 [b]	<0.0002
Parity of mother [3], #	3.0 ± 2.1	2.8 ± 2.1	3.4 ± 2.4	2.9 ± 2.1	3.1 ± 1.4	0.20
Maternal height [4], *cm*	149.8 ± 4.7	149.1 ± 4.6	150.6 ± 4.8	151.2 ± 5.3	149.8 ± 4.3	0.17
Relationship to index child:						
Mother	93.9 (185)	96.2 (102)	85.7 (36)	100.0 (26)	91.3 (21)	0.05
Other family member	6.1 (12)	3.8 (4)	13.0 (6)	0.0 (0)	8.3 (2)	
Education:						0.57
Primary incomplete [5]	27.9 (55)	27.3 (29)	35.7 (15)	23.1 (6)	21.7 (5)	
Primary complete or more[6]	72.1 (142)	72.7 (77)	64.3 (27)	76.9 (20)	78.3 (18)	
Area of origin:						0.0005
Lima & Callao	32.5 (64)	24.5 (26)	23.8 (10)	57.7 (15)	56.5 (13)	
Sierra	61.4 (121)	65.1 (69)	76.2 (32)	38.5 (10)	43.5 (10)	
Other [7]	6.1 (12)	10.4 (11)	0.0 (0)	3.8 (1)	0.0 (0)	
Civil status:						0.73
Married/common law	90.4 (178)	91.5 (97)	85.7 (36)	92.3 (24)	91.3 (21)	
Occupation:						0.41
Labourer [8] or informal work outside home [9]	28.9 (57)	32.1 (34)	33.3 (14)	11.5 (3)	26.1 (6)	
Housewife or student [10]	60.9 (120)	59.4 (63)	57.1 (24)	73.1 (19)	60.9 (14)	
Formal skilled work out of home[11] or farming	10.2 (20)	8.5 (9)	9.5 (4)	15.4 (4)	13.0 (3)	

[1] Data are presented as mean ± SD or % (N); [2] Data for this table were tested for significant differences using one-way ANOVA, Kruskal-Wallis non-parametric test, Chi-square and Fisher's Exact Test when appropriate; [3] Reflects parity of mother of the child; [4] Only the height of the biological mother was measured. Some mothers were not able to be located for this measurement and thus this information is missing for some observations (N=19); [5] Includes caregivers who never attended school, though this was a small number (N=8); [6] Primary complete to university complete; [7] From coastal region beyond Lima or the Amazon region; [8] Agricultural worker in the fields or brick-builder; [9] Maid, vendor in street or stand, cook//waiter; [10] Housewives: (n=116 or 59%); [11] Owns business, working in a factory or sewing shop.

Table 4.4: Characteristics of 178 fathers of preschool-aged children (9-71 mo) of low-income peri-urban households in Lima, Peru by category of urban agriculture activity[1,2,3]

Characteristics	ALL	Scale of urban agriculture			p-value[4]
		No UA *N* = 97	Small *N* = 36	Medium *N* = 24	Large *N* = 21	
Time in community, *y*	13.4 ± 10.8	13.4 ± 10.8 [a,c]	11.9 ± 8.0 [a]	22.0 ± 12.1 [b]	19.8 ± 12.4 [b,c]	0.002
Education						
Primary incomplete[5]	17.2 (30)	11.6 (11)	28.6 (10)	20.8 (5)	20.0 (4)	0.13
Primary complete or more[6]	82.8 (144)	88.4 (84)	71.4 (25)	79.2 (19)	80.0 (16)	
Area of origin						
Lima & Callao	30.7 (54)	29.9 (29)	20.0 (7)	52.2 (12)	28.6 (6)	0.14
Sierra	63.9 (112)	61.9 (60)	77.1 (27)	43.5 (10)	71.4 (15)	
Other[7]	5.7 (10)	8.2 (8)	2.9 (1)	4.4 (1)	0.0 (0)	
Occupation						
Unskilled labour[8]	43.3 (77)	36.1 (35)	58.3 (21)	66.7 (16)	23.8 (5)	0.003
Driver/taxi	16.3 (29)	14.4 (14)	11.1 (4)	12.5 (3)	38.1 (8)	
Formal or skilled work[9]	40.4 (72)	49.5 (48)	30.6 (11)	20.8 (5)	38.1 (8)	
Currently employed	93.3 (166)	92.8 (90)	94.4 (34)	100.0 (24)	85.7 (18)	0.19
Currently steadily employed [10]	31.5 (56)	30.9 (30)	36.1 (13)	29.2 (7)	28.6 (6)	0.92

[1] Data are presented as mean ± SD or % (N); [2] Different superscripts reflect significant group differences using Bonferonni post-hoc tests; [3] Some caregivers could not answer information on paternal variables, therefore some missing values for paternal characteristics; [4] Data for this table were tested for significant differences using one-way ANOVA, Kruskal-Wallis non-parametric test, Chi-square and Fisher's Exact Test when appropriate; [5] Includes fathers who never attended school, though this was a small number (N=2); [6] Primary completed to university completed; [7] Includes fathers originating from coastal regions beyond Lima or Amazon region; [8] Includes those with no defined occupation; [9] Includes owning business; [10] Engaged in relatively stable work that provides fixed regular pay;

4.4 Household food security

Only 11% of households in the entire study sample were classified as food secure (n = 22) (Table 4.5). Most households fell into the low food security (38%, n = 74) and very low food security (26%, n = 51) categories. There were no differences between No UA and the UA groups, nor were there differences by UA groups in the proportion of households falling into the different food security classifications. Food security was weakly correlated to WAZ ($r = - 0.15$, $p = 0.03$), parity ($r = 0.28$, $p < 0.0001$), number of household material assets ($r = - 0.34$, $p < 0.0001$) and food expenditure per household member per week ($r = -0.11$, $p < 0.01$).

4.5 Consumption of animal source foods

Results of the twenty-item food frequency questionnaire showed that most children had consumed on average half of the 20 listed items during the previous week (Table 4.6). On average, caregivers reported that children had consumed the ASF items listed in the questionnaire twenty times during the previous week (Table 4.7), with the most common items being chicken meat and eggs (6 and 5 times eaten during previous week respectively). No significant differences were found in frequency of consumption for any of the twenty listed items of the food frequency questionnaire between UA and non-UA households. One-way ANOVA did not reveal significant differences in frequency of consumption for any of the twenty listed items of the food frequency questionnaire between UA scale categories except for beans and lentils (Table 4.7). For the beans and lentils group the Small UA group had a significantly higher frequency of consumption than the Medium UA group; however no other significant differences were found between the different UA scale groups. A weak relationship was observed between frequency of consumption of ASF and indicators of household wealth such as material assets ($r = 16$, $p < 0.05$) and weekly food expenditure per household member ($r = 0.19$, $p < 0.01$). Frequency of consumption of ASF was not correlated to food security score, monetary value of UA, or HAZ of children.

Table 4.5: Percentage of food secure vs. food insecure among 197 low-income peri-urban households with preschool-aged children (9-71 mo) in Lima, Peru by urban agriculture category[1]

Food Security Status	ALL	Scale of urban agriculture			p-value[2]
		No UA	Small	Medium	Large	
		N = 106	*N* = 42	*N* = 26	*N* = 23	
Food secure	11.2 (22)	12.3 (13)	9.5 (4)	11.5 (3)	8.7 (2)	0.44
Marginally food secure	25.4 (50)	25.5 (27)	21.4 (9)	42.3 (11)	13.0 (3)	
Low food security	37.5 (74)	37.7 (40)	35.7 (15)	34.6 (9)	43.5 (10)	
Very low food security	25.9 (51)	24.5 (26)	33.3 (14)	11.5 (3)	34.8 (8)	

[1] Data are presented as mean % (N); [2] Data for this table tested for significant differences using a Chi-square.

Table 4.6: Total number of different items from food frequency questionnaire consumed during previous week by group among 197 preschool-aged children (9-71 mo) of low-income peri-urban households in Lima, Peru by urban agriculture category[1]

Number of different of food frequency items per week	ALL	Scale of urban agriculture			p-value[2]
		No UA	Small	Medium	Large	
		N = 106	*N* = 42	*N* = 26	*N* = 23	
All food items[3]	10.07 ± 3.35	9.9 ± 3.3	10.6 ± 3.0	9.2 ± 3.9	10.7 ± 3.5	0.27
ASF [4]	5.52 ± 2.01	5.5 ± 2.0	5.5 ± 2.0	5.2 ± 2.2	6.1 ± 1.9	0.43
Vegetables [5]	3.04 ± 1.42	2.9 ± 1.4	3.4 ± 1.2	2.8 ± 1.7	3.2 ± 1.4	0.29
Beans/lentils	1.50 ± 0.67	1.5 ± 0.6	1.7 ± 0.6	1.3 ± 0.8	1.5 ± 0.7	0.15

[1] Data are presented as mean ± SD; [2] Data were tested for significant differences using one-way ANOVA and Kruskal-Wallis non-parametric analysis of where appropriate; [3] All twenty food frequency questionnaire items: chicken liver, chicken gizzard, chicken blood, chicken meat, fresh and canned fish, beef, mutton, cow spleen, cow lungs, guinea pig, bean, lentils, carrots, squash, spinach, beets, chard, broccoli; [4] Includes only the ASF from food frequency questionnaire; [5] Includes all vegetables included in food frequency questionnaire.

Table 4.7: Frequency of consumption during previous week of items from food questionnaire among 197 preschool-aged children (9-71 mo) of low-income peri-urban households in Lima, Peru, by urban agriculture category[1,2,3]

Servings per week of food frequency items/groups	ALL	Scale of urban agriculture			p-value[4]
		No UA *N* = 106	Small *N* = 42	Medium *N* = 26	Large *N* = 23	
Animal source foods [5]	19.6 ± 11.4	19.6 ± 11.6	20.5 ± 10.0	15.6 ± 11.1	22.3 ± 12.5	0.07
Poultry [6]	3.1 ± 4.3	3.4 ± 5.4	3.2 ± 3.0	1.9 ± 1.8	2.8 ± 2.8	0.53
Eggs	4.6 ± 3.9	4.4 ± 3.6	5.0 ± 4.4	4.0 ± 4.2	5.4 ± 4.0	0.10
Fish [7]	3.2 ± 3.1	3.1 ± 2.8	3.3 ± 3.3	1.8 ± 1.3	4.6 ± 4.7	0.08
Meat [8]	2.4 ± 2.7	2.3 ± 2.3	2.7 ± 3.8	2.1 ± 2.6	2.6 ± 1.7	0.46
Vegetables [9]	16.6 ± 12.8	17.1 ± 13.4	18.1 ± 12.3	14.5 ± 11.6	13.5 ± 12.4	0.32
Green, leafy [10]	2.9 ± 4.5	3.0 ± 5.0	3.1 ± 3.7	2.8 ± 4.5	2.3 ± 3.0	0.60
Beans/lentils	2.7 ± 2.2	2.8 ± 2.1 [a,b]	3.0 ± 2.1 [a]	1.9 ± 2.1 [b]	2.6 ± 2.2 [a,b]	0.04

[1] Data are presented as mean ± SD; [2] Post hoc tests were carried out using Wilcoxon non-parametric tests with Bonferroni's adjustment; [3] Different superscripts reflect significant group differences using Bonferonni post-hoc tests; [4] Data were tested for significant differences using Kruskal-Wallis non-parametric analysis of variance; [5] Includes all items listed in footnotes 6-8; [6] Includes chicken liver, gizzard, blood and meat; [7] Includes fresh and canned fish; [8] Includes beef, mutton, cow spleen, cow lungs and guinea pig; [9] Includes carrots, squash, spinach, beets, chard, broccoli; [10] This group consists solely of spinach, chard and broccoli;

4.6 Morbidity and child nutritional status

Approximately 75% of caregivers (n = 146) reported that children had displayed some symptom of illness during the previous week, cough being the most common (52%). These rates were consistent across all four UA groups.

Overall, nutritional status of children did not differ based on UA status (engaging vs. not engaging). However, nutritional status of children did significantly differ across stratified UA scale groups in terms of HAZ ($p < 0.05$) and WHZ ($p = 0.05$) (Table 4.8). Children in the Small UA group had a lower mean HAZ (-1.49 ± 0.99) than children in the Medium UA group (-0.77 ± 1.16) ($p = 0.05$). No significant differences were found between other pairs of UA scale groups for this variable. In terms of WHZ, children in the Medium UA group had lower average scores (0.40 ± 0.97) than children of the Large UA group (1.14 ± 1.18) ($p < 0.05$). Approximately 20% of all children in the study sample were stunted. No differences were observed between UA scale groups in rates of stunting, underweight or wasting.

Table 4.8: Characteristics of 197 preschool-aged children (9-71 mo) living in low-income peri-urban households in Lima, Peru, by category of urban agriculture activity[1,2]

Child characteristics	All	Scale of urban agriculture			p-value[3]
		No UA	Small	Medium	Large	
		N = 106	*N* = 42	*N* = 26	*N* = 23	
Age, *mo*	36.4 ± 16.7	35.0 ± 16.3	39.1 ± 16.3	34.9 ± 14.5	39.5 ± 21.5	0.42
Weight, *kg*	14.0 ± 3.6	13.8 ± 3.3	14.1 ± 3.1	13.6 ± 2.8	15.3 ± 5.6	0.28
Height, *cm*	90.6 ± 11.5	90.0 ± 10.5	91.4 ± 11.6	90.9 ± 11.0	92.0 ± 15.9	0.82
Height-for-age Z-score	-1.12 ± 1.05	-1.09 ± 0.97[a,b]	-1.49 ± 0.99[a]	-0.77 ± 1.16[b]	-1.00 ± 1.26[a,b]	0.04
Weight-for-age Z-score	-0.09 ± 0.94	-0.07 ± 0.88	-0.31 ± 0.82	-0.14 ± 0.96	0.28 ± 1.29	0.11
Weight-for-height Z-score	0.74 ± 0.93	0.74 ± 0.89[c,d]	0.74 ± 0.81[c,d]	0.40 ± 0.97[c]	1.14 ± 1.18[d]	0.05
Stunted [4]	20.8 (41)	19.8 (21)	26.2 (11)	11.5 (3)	26.1 (6)	0.47
Underweight [5]	1.5 (3)	0.9 (1)	2.4 (1)	3.8 (1)	0 (0)	0.44
Wasted [6]	0.5 (1)	0 (0)	0 (0)	3.8 (1)	0 (0)	0.25
Morbidity						
≥ 1 symptom [7]	74.1 (146)	73.6 (78)	71.4 (30)	80.8 (21)	73.9 (17)	0.86
Symptoms [7], #	1.3 ± 1.0	1.3 ± 1.0	1.2 ± 1.0	1.4 ± 1.0	1.3 ± 1.2	0.84

[1] Data are presented as mean ± SD or % (N); [2] Different superscripts reflect significant group differences using Bonferonni post-hoc tests; [3] Data for this table was tested for significant differences using one-way ANOVA, Kruskal-Wallis non-parametric test, Chi-square and Fisher's Exact Test when appropriate; [4]Stunting: HAZ < -2SD NCHS/WHO International Growth Reference; [5] Underweight: WAZ < -2 SD below NCHS/WHO International Growth Reference; [6] Wasting: WHZ < -2SD below NCHS/WHO International Growth Reference; [7] Possible symptoms included cough, fever, vomiting and loose stools.

4.7 Results of hypotheses testing

4.7.1 Household food security and UA

Logistic regression analysis of the cumulative multinomial food security outcome variable was first carried out treating UA engagement as a dichotomous variable (UA vs. no UA households). This first model did not reveal a significant difference between households in the level of food security based on overall UA status (Table 4.9a) and therefore the null hypothesis of no difference in household food security level by UA status was accepted. Community of residence, type of household water source, weekly household food expenditure and household material assets were variables that were significantly associated with household food security status in this model. In this model, households residing in the community of Nieveria had almost a four-fold increased risk of experiencing increasing food insecurity compared to households from Huachipa. Having an unclean and unreliable household water source was associated with a three-fold increased risk of greater household food insecurity compared to households having a piped water source. A one-unit increase in household material assets was associated with a 27% decrease in experiencing increasing household food insecurity, and each one-unit increase (one sole) in weekly household food expenditure was associated with a 4% decrease.

Table 4.9a: Multinomial logistic regression of food security model containing dichotomous UA variable using a random effects model

Determinants	OR	(95% CI)
Demographic variables		
Engaging in UA activity [1]	1.46	(0.81, 2.61)
Household from community of Nieveria [2]	3.58*	(1.37, 9.40)
Socioeconomic variables		
Walls of non-permanent materials [3]	1.90	(0.81, 4.44)
Water source [4]		
Unclean/unreliable source [5]	3.03*	(1.02, 8.99)
Cistern truck	1.51	(0.61, 3.76)
Public pump	0.65	(0.24, 1.77)
Household material assets [6], #	0.73***	(0.61, 0.87)
Food expenditure per household member per week [7], *soles/wk*	0.96**	(0.94, 0.99)

[1] Reference: Households not engaging in UA (urban agriculture);
[2] Reference: Household from community of Huachipa;
[3] Reference: Walls of semi-permanent (adobe) or permanent (un/finished brick) materials;
[4] Reference is clean reliable home water connection;
[5] From rivers/streams, wells or "other";
[6] Include radio, speakers, television, cell/phone, blender, bi/tricycle, motorcycle/mototaxi/car, sewing machine; refrigerator, washing machine;
[7] Expressed in New Peruvian Soles (PEN) ($1US=2.91PEN)
*p < 0.05; **p< 0.01; ***p< 0.001

A second multinomial logistic regression model for household food security level was analyzed in which UA was not considered as a dichotomous variable but rather as a multi-leveled categorical variable based on the scale of UA activity of households (Table 4.9b). This regression model showed only a non-significant trend towards an increased risk of experiencing escalating food insecurity among Large UA households compared to households not engaged in UA (p = 0.09); no significant differences were found in household food security status between households engaged in small or medium scale UA and households not engaged in UA. Thus, as in the previous model shown in Table 4.9a, the null hypothesis was not rejected. Household socioeconomic factors in this second model found to be significantly associated with a decreased risk of food insecurity were similar to those of the first model. Increasing levels of household material assets and weekly household food expenditure were found to significantly reduce the risk of experiencing increasing food insecurity in this model; a one-unit increase in household material assets was associated with a 27% decrease in experiencing increasing

household food insecurity; and each one-unit increase (one sole) in weekly household food expenditure was associated with a 3% decrease. Community of residence of households was not found to be significantly associated with food security level in this model.

Table 4.9 b: Multinomial logistic regression of food security model containing UA categories using a random effects model

Determinants	OR	(95% CI)
Demographic variables		
UA scale[1]		
Small UA / Medium UA	1.01	(0.54, 1.90)
Large UA	2.32	(0.87, 6.18)
Socioeconomic variables		
Walls of raw/impermanent materials [2]	2.10	(0.91, 4.86)
Household material assets [3], #	0.73***	(0.61, 0.88)
Food expenditure per household member per week [5], *soles/wk*	0.97**	(0.94, 0.99)

[1] Reference: No UA (urban agriculture);
[2] Reference: walls of semi-permanent (adobe) or permanent (un/finished brick) materials;
[3] Include radio, speakers, television, cell/phone, blender, bi/tricycle, motorcycle/mototaxi/car, sewing machine; refrigerator, washing machine;
[4] Expressed in New Peruvian Soles (PEN) ($1US=2.91PEN)
*p < 0.05; **p< 0.01; ***p< 0.001

4.7.2 Animal source food consumption and UA

Table 4.10 demonstrates socioeconomic and demographic factors significantly associated with frequency of consumption of ASF among preschool-aged children using linear regression analysis. Prior bivariate analysis indicated that frequency of consumption of ASF was not significantly different between UA and non-UA households; therefore in this random effects linear regression model, the scale of UA engagement was investigated further by treating this variable as a multi-leveled categorical variable rather than as a dichotomous variable. This regression analysis revealed that children of Large UA households were reported to have consumed ASF more frequently throughout the week compared to children of No UA households ($\beta = 9.06$, $p < 0.05$). However, an interaction term combining paternal length of residence in the community with Large UA status was associated with a

significantly decreased frequency of consumption of ASF (β= -0.29, p<0.01). Overall, these results support accepting the null hypothesis of no

Table 4.10: Linear regression of variables associated with frequency of servings of animal source foods provided to 197 preschool-aged children (9-71 mo) during previous week using a random effects model

Parameter	Estimate	SE	p-value
UA scale [1]			
Small UA	5.60	4.02	0.17
Medium UA	-5.93	3.73	0.12
Large UA	9.06	4.25	0.04
Paternal length of residence by UA scale [2]			
Paternal length of residence by Small UA	-0.26	0.27	0.34
Paternal length of residence by Medium UA	-0.04	0.11	0.74
Child birth weight, *kg*	2.89	1.59	0.07
Maternal characteristics			
Parity, #	1.37	0.53	0.01
Paternal characteristics [3]			
Paternal primary education incomplete	-7.21	2.61	0.007
Father not steadily employed	-3.93	2.00	0.05
Household characteristics			
Household from Nievería [4]	7.76	2.94	0.009
Nuclear family of index child does not live with extended family [5]	-4.05	1.95	0.04
Household material assets, #	1.21	0.60	0.05
Wall materials raw/impermanent [6]	-4.59	3.06	0.14
Water source [7]			
Unclean/unreliable source [8]	7.20	3.69	0.05
Cistern truck	3.34	2.86	0.25
Public pump	1.80	3.17	0.57
Use Glass of Milk Program	-4.80	1.90	0.01

[1] Reference is No UA (urban agriculture);
[2] Reference is interaction No UA group*paternal length of residence;
[3] Reference is at least primary education complete;
[4] Reference is household is from Huachipa;
[5] Reference value is that family owns home of residence (If do not own, are either renting home/property or are living in the home of extended family);
[6] Reference is having walls of semi-permanent of permanent materials;
[7] Reference is clean reliable home connection;
[8] From rivers/streams, wells or "other";

difference between children of UA vs. non-UA households in frequency of consumption of ASF.

Analysis of the other factors considered in the model revealed that preschool-aged children were reported to have consumed ASF more frequently among households with the following characteristic: they lived in

Nievería; the nuclear family was living in the home of extended family; the caregiver had more parity; the father had at least a primary school level of education and was employed in steady regular paying work; the household owned more material assets; and did not use the Glass of Milk program. Another household factor found to be associated with higher frequency of consumption of ASF was having access only to an unreliable and unclean source for drinking water.

Conversely, preschool-aged children had lower frequency consumption of ASF among households with the following characteristics: they resided in the community of Huachipa; they consisted of nuclear families with less children; the father had not completed at least primary school and was not employed in steady regular paying work; they had access to a reliable home water connection; and were participants in the government-funded Glass of Milk program[26].

4.7.3 Child nutritional status and UA

Being a member of a Small UA household compared to being a member of household not engaged in UA was also associated with decreased child HAZ. Being a member of a Medium or Large UA household compared to a No UA household was not associated with HAZ of children. Preschool-aged children's HAZ were positively associated with higher child birth weights, caregivers having at least primary education complete and households having less crowding (Table 4.11). Having unclean and reliable household water sources, or receiving potable water from a cistern truck, compared to having a reliable home water connection, was associated with decreased HAZ among children.

[26] This program provides milk and/or oatmeal as the first meal of the day at a reduced cost for low-income households throughout the country [25].

Table 4.11: Linear regression of variables associated with HAZ for 197 preschool-aged children (9-71 mo) of low-income peri-urban households living in Lima, Peru using a random effects model

Parameter	Estimate	SE	p-value
UA scale [1]			
Small	-0.38	0.18	0.03
Medium/Large	0.00	0.17	0.99
Child birth weight, *kg*	0.48	0.12	< 0.0001
Caregiver primary education incomplete [2]	-0.49	0.17	0.004
Household characteristics			
# household residents per room [3]	-0.15	0.05	0.001
Water source [4]			
Unclean/unreliable source [5]	-0.50	0.25	0.04
Cistern truck	-0.42	0.21	0.04
Public pump	-0.23	0.23	0.33

[1] Reference is No UA (urban agriculture);
[2] Reference is at least primary education complete;
[3] Total number of household members by total # of rooms in the home;
[4] Reference is a reliable clean home water connection;
[5] Unclean/unreliable source: from rivers/streams, wells or "other"

5. DISCUSSION

Contrary to the research hypotheses set out in the primary and secondary objectives, results from descriptive and regression analyses on household food security, dietary adequacy measured as variety and frequency of consumption of ASF, and child nutritional status measured as height-for-age, did not show significant differences between UA and non-UA households. However, further stratification of the UA group by scale provided some evidence that UA participation was associated with children's diets and nutritional status, but not household food security.

5.1 Association between scale of UA activity and ASF consumption

Households engaged in larger scale UA activity, raising more and/or higher value livestock, had greater frequency of consumption of commonly consumed non-dairy ASF compared to non-UA households. Similarly, Yeudall et al. in Kampala, Uganda found that households raising livestock had significantly higher dietary diversity scores among children from households not raising animals [18]. UA in the form of livestock rearing directly contributed to the availability, access and utilization of ASF in the diets of children, and improved child nutritional status. In contrast, it was found in our study that the majority of households engaged in Large UA were raising livestock with the intention of selling them and generating surplus income rather than producing food for household consumption. Therefore, the increase in frequency of consumption of ASF observed among children of the Large UA group likely resulted from increased purchasing power for these high-cost foods rather than direct provisioning from UA production.

Two unexpected factors found to be associated with a higher frequency of consumption of ASF were living in Nievería and having a poor quality household water source. It is difficult to interpret these observed associations. One factor may be the respondents' education level. Caregivers of Nievería tended to be less educated than caregivers of Huachipa and may have had more difficulty in accurately recalling dietary intakes over seven days. A

similar educational difference was seen between caregivers from households with an unclean/unreliable source of water and those from households with a clean, reliable home water-connection.

5.2 Association between scale of UA activity and child nutritional status

Children of households classified as Small UA, had the lowest height-for-age z-scores compared to all other households in both the UA and non-UA groups. It is believed that other individual and household factors contributing to lower nutritional status among young children are the same factors limiting the scale of UA engagement in this group. Households in the Small UA group had very low indicators of both long-term and short-term wealth. They were the group with the greatest proportion of caregivers who were migrants to the study communities from the rural Highlands region where extreme poverty and malnutrition rates are the highest in the country [74, 76]. Their poor socioeconomic conditions could be important factors that have affected the quality of care that these women have provided to their young children, negatively affecting their nutritional status.

5.3 Association between UA engagement and duration of residence

In Mwangi-Mboganie and Foeken's study in Nairobi, Kenya [17], it was found that non-farming households had resided for less time in the city of Nairobi than farming households. The authors suggested that in their study sites lower duration of residence limited the availability of support networks and the ability to acquire land, preventing newly arrived households from engaging in UA. Though they did not formally evaluate this, it appeared to the authors that length of residence in the city was an important factor affecting food security of low-income households. In our study, length of residence in the peri-urban study areas was related to UA engagement; however, no relationship was seen with this variable and food security and household economic factors. Our findings and those of Mwangi-Mboganie and Foeken suggest that the availability of social networks and greater permanency within

the city are important factors influencing whether households are able and choose to engage in UA.

5.4 Association between scale of UA and household food security

The UA scale used to stratify the UA category into sub-groups was based on the monetary value of the UA activity being carried out within households and was therefore essentially a scale of UA wealth. Thus it was hypothesized that increasing UA scale from No UA to Large UA would be associated with increased household food security; however this relationship was not shown. The absence of this relationship was most likely due to three factors. First, the overwhelming majority of participants in our study were food insecure, and were mostly classified as low and very low food security households. Thus there may not have been enough variation in food security status between households to pick up a difference based on UA participation. Second, there were no significant differences found between groups in in terms of household material assets and household food expenditure; these indicators of wealth were found to be significantly associated with household food security status during regression analysis. Lastly, it was found that many UA households, particularly Large UA households, did not engage in UA activity for the purpose of better food security. Rather, many UA households cited using money earned from selling UA animal products to sustain their UA activities and for other non-food household expenses. The studies carried out by Yeudall et al. [18] and Mwangi-Mboganie [17] also did not show a significant association between urban farming and food security.

5.5 Strengths

5.5.1 Novel aspects

This study is the first to evaluate the relationship between UA practices and household food security, children's diets and child nutritional status in Latin America. A unique aspect of this study was that animal rearing was the predominant UA activity rather than crop cultivation, mainly due to

climatic conditions. Lima is situated in Peru's coastal desert region which has one the lowest annual rainfalls in the world. Any agricultural activity in the area must be supported through intensive irrigation. This is in contrast to documented UA activities among low-income food insecure households in Kampala, Uganda and Nairobi, Kenya where crop cultivation was a more important UA activity than keeping livestock. In these cities crop cultivation was being carried out both on people's small plots as well as in vacant lots throughout the city, and relied predominantly on rain water. Access to potable water comes at a high cost for the peri-urban poor, therefore making crop cultivation inaccessible for most low-income households. Therefore, the results of this study contribute new information on UA in the form of livestock-raising that is being practiced in a setting that is very different from those described previously.

5.5.2 Appropriate study population

An additional strength was that study participants were recruited through their membership in local community kitchen organizations. This allowed the study to focus on a segment of the population that is very food insecure, extremely vulnerable to economic shocks and changes in global food systems [87, 88]. Community kitchen members are women who have come together around the issue of food and feeding their families because of severe economic constraints and who are particularly attuned to the importance of coping strategies. They are thus a suitable population for investigating the role of urban food production in food and nutrition security among the urban poor of low-income countries. In addition, these community kitchen organizations have been venues of grass-roots organizing for community development and solidarity, political action, the empowerment of women [81, 93] and nutrition research and education interventions [75, 77, 82]. They are therefore an accessible population for possible future community interventions that incorporate UA as a food-based strategy to improve child nutrition.

5.5.3 Methodology: random effects and clustering

The use of a random effects regression model, in which community kitchens nested within the two study areas were the random effect, controlled for the clustering effect of these organizations, thus accounting for the variability between different community kitchens and the similarities within them. Therefore the community kitchens in the study were reasonably representative of those located within the district of Lurigancho-Chosica and similar low-income peri-urban areas throughout Metropolitan Lima [94].

5.6 Methodological limitations

5.6.1 Study design

Ideally, a study designed to investigate the impact of UA on food and nutrition security would do the following: follow households that are consistently engaged in UA over time in order to measure dietary adequacy for the index child; observe how the products of UA are used specifically in terms of the household diet, either through direct provisioning of home-grown fresh food or by generating surplus income which is used to purchase more and better quality market foods; compare UA households to appropriate non-UA households as controls; and measure young children's health and growth status over time.

For this study, a cross-sectional approach was taken, mainly due to limited time and resources available for the data collection phase. However, considering the predictor and outcome variables of interest, a longitudinal design collecting data at different time points could have provided clearer evidence for the hypothesized relationships. This is particularly relevant for the HAZ variable, which is a chronic measure of nutritional status and is thus affected by cumulative factors over the duration of the child's life and even before birth [73]. This could be the reason why the overall effect of UA activity on children's HAZ was not found to be significant in this study.

5.6.2 Definition of UA

The broad definition of UA employed in our study most likely was a reason for the lack of significant differences shown between the UA and non-UA households. Our definition of UA engagement was very wide-ranging in its inclusion criteria, incorporating households raising only one chicken and households raising over 40 animal units in the same group. In addition, this definition did not take into account UA activity carried out prior to the day of the interview, and therefore may not have effectively segregated the sample population into distinct UA vs. no UA groups. For example, if a household had been rearing chickens for several years, but discontinued this activity only a month before the study, this household would still have been considered a non-UA household; conversely, households that had been engaged in this activity only a couple of months were included into the UA group. This is likely to have been a confounding factor in our results.

5.6.3 Recruitment and sample size

The participants recruited for this study were members of community kitchens in the peri-urban study communities. As mentioned, recruiting this particular segment of the population was very appropriate for research into the use of UA as a coping strategy among food insecure low-income households. This approach for recruitment also provided for a relatively homogeneous sample population, thus reducing the amount of confounding variables that had to be controlled for during analysis. However, this method of enrolment proved to be limiting in the number of participants that could be recruited. On average each community kitchen comprised approximately 19 members, only a small portion of which were caregivers for a preschool-aged child. After recruiting the maximum number possible of eligible community kitchen members from all existing community kitchens in both Nieveria and Huachipa (N = 197), the pre-set sample size of 196 participants was just barely met. If it had been possible to continue recruiting more community kitchen members, stricter eligibility criteria for UA engagement could have provided a clearer

division between households in terms of UA status. A larger study sample would also have allowed the stratified groups to be larger in size and would have therefore provided more reliable results. Unfortunately, due to time and resource constraints, further recruitment was not an option. Another recruitment approach considered was to do a census of the two communities, since one was not available to the research team at the time. However, carrying out such a census would have been difficult for the research team to realize due to time and resource constraints, thus making this method unfeasible. A different mode of recruitment that could have been employed would have been to cluster sample preschools or daycares in the study areas. This may have allowed for greater enrollment at each cluster site, thus increasing the efficiency recruitment and perhaps the total sample size.

6. FINAL CONCLUSIONS

6.1 Relevance and recommendations

The interest in UA and its role in food security and child nutrition has increased substantially in recent years [4], and is likely to increase even more due to climate change and the global food crisis. Though there has been some evidence to show that UA is positively associated with better food and nutrition outcomes, more quantitative well-designed studies that include adequate controls have been called for to provide firmer evidence of this relationship. Future studies on UA in relation to food security and nutrition should look at these relationships in the context of other relevant aspects associated with UA practices. These include the risks associated with the environment and human health, intra-household resource allocation, and the influence of women's empowerment on children's health and nutrition. Experts on child malnutrition in low-income countries have proposed that successful interventions aimed at child growth and development should be food-based with strong links to agriculture and should centre on community involvement [95]. With these findings in mind, planning of future UA interventions among the urban poor to alleviate poverty, food insecurity and child malnutrition should take a participatory approach focusing on gender and women's UA roles, and should also incorporate hygiene and nutrition education. In the peri-urban communities of Lima, UA interventions should target those households engaged in small amounts of UA activity. Those households with only a limited scale of UA were found to have comparatively the poorest socioeconomic and child nutrition indicators and could thus benefit most from such interventions as described above.

6.2 Women the main actors in UA

Congruent with what has been shown extensively throughout the UA literature [4, 15, 16, 19, 67, 96], our study found that female caregivers were consistently the main actors in UA. During qualitative in-depth interviews

conducted among a subsample of UA households, women revealed that this activity was a vital resource for them to provide nourishment to their families, especially when household incomes had been unstable and insufficient to meet household expenses. Some also reported that managing the sale of UA products allowed them to exert a certain level of financial independence from their husbands. Studies on UA and gender in Africa have found that engagement in UA can promote women's empowerment and increase women's status and decision-making power within their households [4, 19, 96, 97]. Also, studies among rural agricultural households in Africa and Asia have found that food security and child nutrition were greatly impacted by how much women were able to control the allocation of household resources [65]. Though women's status is relatively higher in Latin America than it is in Asia or Sub-Saharan Africa [98], low-income women in Peru are at a substantial disadvantage to men in terms of health, social status, access to education and employment [74, 76]. In the peri-urban communities of Lima, engaging productively and autonomously in UA may increase low-income women's self-efficacy, thus helping them to be empowered and better able to provide proper nourishment to their children without having to rely solely on the incomes of other household members.

6.3 UA debate – too risky?

Advocacy of UA as a means of reducing poverty and malnutrition and achieving better food security among the urban poor of low-income countries is a contentious issue for several reasons. A very important concern is the health risks associated with UA, including contamination of UA products and exposure to animal feces and diseases. Contamination of fresh vegetables produced via intensive UA with hazardous pesticides and fecal coliforms arises due to the use of sewage-contaminated water for irrigation of crops and overuse of low-cost hazardous pesticides and insecticides [99]. Such an issue is particularly relevant in places where access to potable water is limited or where there is very little rainfall, such as in the coastal desert region where

Metropolitan Lima is situated. Consumption of contaminated food may increase the risk of diarrheal disease morbidity which has been shown to be strongly associated with child malnutrition and infant mortality [55].

Also, keeping poultry and other types of livestock in close proximity to humans increases exposure of children to animal feces, such as chicken feces, leading to transmission of *Campylobacter jejuni* [66]. Poultry production amid cramped conditions in urban centres is also believed to be the root cause of the global outbreak of the Highly Pathogenic Avian Influenza virus [100]. These hazards seriously endanger human health, particularly the health of young children. These risks are highly relevant for our study population for whom the most common form of UA activity was rearing chickens. Improper containment of animals and poor hygiene practices could very likely have been a contributing factor to the high rates of morbidity seen among children in our study. Proper management of UA animals and good hygiene are therefore essential in order to achieve the maximum nutritional benefits of a nutrition intervention that promotes greater food security through urban agriculture activities.

Another issue is women's burden of work. In developing countries, there is a strong divide in gender roles within the household related to reproductive activities, such as obtaining food and water, cooking, cleaning, washing clothes, and looking after children, elders, and the sick. In addition to these responsibilities, many low-income urban women are engaged in some form of petty trade or street vending [101]. This divide in gender roles may have negative consequences for women engaged in UA. In some cases, increased participation in UA may place an added burden on women, contributing to an even longer work day. Having no spare time often keeps women from acquiring higher-paying informal or formal sector occupation [67]. In this sense, urban agriculture may become a low-income trap that confines unskilled women. The caregivers of our study tended to be heavily burdened as the main person responsible for domestic duties. Many women also engaged in some form of income generation in addition to their duties as

caregivers and of maintaining the home. However, the unique situation of being part of a community kitchen network did seem to provide some assistance to these women, reducing the work and time required to cook meals and acquire food. These organizations also provided a means of reducing social isolation and promoting greater community support and development. UA interventions would thus be most effective if planned and implemented through such established community organizations and would provide an opportunity for low-income women to reap the benefits of UA.

Finally, there is the issue of how UA is used by low-income households – for direct availability, access and utilization of UA products for the household diet, or for generating income which can subsequently be used to purchase higher quality foods from the market. In our study we found that mainly the poorest of UA participants used their livestock production directly for feeding household members. On the other hand, more wealthy UA participants mostly used this production solely as a means of earning cash that could be used for non-food related expenses. This could explain why UA engagement was not found to be associated with better household food security, regardless of the scale of the activity or the wealth of the participating households.

6.4 Future planning of integrated UA interventions

Whichever way UA activity is promoted through community-based interventions, either as a direct source of household food supply or as a means of generating surplus income, it is imperative that these interventions incorporate nutrition and hygiene education, training in pest-management and water treatment, and promotion of social support mechanisms for women's engagement. Environmental and human health risks associated with raising animals in an urban setting can be effectively reduced using simple modifications in livestock management, while increasing profitability and sustainability [66, 99, 102]. By promoting UA among women's groups that are already in place, like in community kitchens, UA may become a means of

empowering low-income women and providing them with a supportive infrastructure that is available to them when facing difficulties. Finally it is imperative that any UA intervention be combined with nutrition education. In the peri-urban communities of Lima where rates of child stunting and anemia are pervasive, direct access to ASF through UA can provide important micronutrients to children's diets that are crucial for proper growth and development.

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APPENDIX A: Ethics approval from Research Ethics Board of the Faculty of Agricultural and Environmental Sciences

McGill

Research Ethics Board
Faculty of Agricultural and Environmental Sciences

McGill University
Macdonald Campus
21 111 Lakeshore
Saint-Anne-de-Bellevue, QC
H3A 2T5

Tel: (514) 398-8716
Fax: (514) 398-8732
www.mcgill.ca/macdonald/research/compliance/human/

Research Ethics Board
Faculty of Agricultural and Environmental Sciences
Certificate of Ethical Acceptability of Research Involving Humans

REB File #: 890-0607

Project Title: Does engagement in urban agriculture impact household food security and nutritional status of preschool-aged children living in a peri-urban district of Lima, Peru?

Principal Investigator: Andrea Maldonado **Department:** School of Dietetics and Human Nutrition

Status: Graduate Student **Supervisor:** Grace Marquis

Funding Agency and Title: Grace Marquis incentive fund from Iowa State University

Expedited Review X
Full Review ____

This project was reviewed and approved by

Manfred E. Rau, Chair
REB, Faculty of Agricultural and Environmental Sciences

Approval Period: June 12, 2007 to June 11, 2008

This project was reviewed and approved in accordance with the requirements of the McGill University Policy on the Ethical Conduct of Research Involving Human Subjects and with the Tri-Council Policy Statement: Ethical Conduct For Research Involving Humans

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*All research involving human subjects requires review on an annual basis. A Request for Renewal form should be submitted at least one month before the above expiry date.
*If a project has been completed or terminated and ethics approval is no longer required, a Final Report form must be submitted.
*Should any modification or other unanticipated development occur before the next required review, the REB must be informed and any modification can't be initiated until approval is received.

APPENDIX B: Ethics approval from Nutrition Research Institute

INSTITUTO DE INVESTIGACION NUTRICIONAL
Av. La Molina 1885 (Ex Av. La Universidad 685) – La Molina
Telf.: (51-1) 349-6023 Fax: (51-1) 349-6025
RUC 20117792634

La Molina, 18 de Julio 2007
N° 256-2007/CEI-IIN

ANDREA MALDONADO B.Sc
Investigadora Principal
Instituto de Investigación Nutricional
Av. La Molina # 1885
La Molina, Lima 12.-

Referencia.- "¿Afecta la participación en la agricultura urbana a la seguridad alimentaria y el estado de nutrición de niños de edad preescolar que viven en distritos periféricos de Lima, Perú?"

Estimada Srta. Maldonado,

El Comité de Ética del Instituto de Investigación Nutricional tiene el agrado de comunicarle, que en la sesión del 05 de julio 2007, se revisó el proyecto mencionado en referencia, presentado a los miembros del comité para su consideración, ha sido revisado y luego de recibir las modificaciones sugeridas por el Comité de Ética, se aprueba con el **No. 256-2007/CEI-IIN.**

Asimismo, informamos que los documentos aprobados son los siguientes:

1. Propuesta de Investigación, versión 02: Julio 2007.
2. Resumen del Protocolo, versión 01: Mayo 2007.
3. Hoja de Información y Consentimiento, versión 02: Julio 2007.
4. CV de la Investigadora Principal.

Esta aprobación tendrá validez de un año a partir de la fecha y su solicitud de renovación deberá estar acompañada de un resumen de avance de actividades, en el caso de continuar, y un informe final al terminar el proyecto.

Es nuestro deseo recordarle, que si hubiera alguna reacción inesperada en el estudio, así como cualquier modificación que se le haga al protocolo, éstas deberán ser informadas inmediatamente.

Agradeceremos que en el futuro cite el número de aprobación en su correspondencia, u otro documento referente al estudio.

Atentamente,

Dr. Enrique Morales Moreno
Past-Presidente, Comité de Ética de Investigación
Instituto de Investigación Nutricional – IIN

Cc: Dirección General / Administración

Apartado 18 – 0191 Lima 18, PERU
Mail : etica@iin.sld.pe - Comité de Ética / www.iin.sld.pe

APPENDIX C: Ethics approval from Nutrition Research Institute

INSTITUTO DE INVESTIGACION NUTRICIONAL
Av. La Molina 1885 (Ex Av. La Universidad 685) – La Molina
Telf.: (51-1) 349-6023 Fax: (51-1) 349-6025
RUC 20117792634

14 de Noviembre, 2007
475-2007/CEI-IIN

ANDREA MALDONADO, B.Sc
Instituto de Investigación Nutricional
Av. La Molina # 1885
La Molina.-

Ref.: Proy. N°256-07/CEI-IIN "¿Afecta la participación de la agricultura urbana (AU) a la seguridad alimentaria y el estado de nutrición de niños preescolares y lactantes que viven en distritos periféricos de Lima, Perú?".

Estimada Srta. Maldonado,

Con referencia a su carta **365-2007/PROYs-IIN** emitida el 13 de noviembre del presente, el Comité de Ética del Instituto de Investigación Nutricional tiene el agrado de comunicarle que se revisó y aprobaron las sugerencias incluidas en el Resumen del protocolo y la Hoja de Información y Consentimiento, con versión 3: Noviembre 2007 para ambos documentos.

Cabe mencionar, que el cambio es la ampliación del rango de edades de los niños, desde los 9 meses de edad hasta 5 años y por lo tanto la inclusión de la palabra **lactantes** en el título del proyecto.

Sin otro particular por el momento, me despido de usted.

Atentamente,

Instituto de Investigación Nutricional IIN COMITE ETICA Lima – Perú

Dr. Enrique Morales Moreno
Past-Presidente, Comité de Ética de Investigación
Instituto de Investigación Nutricional – IIN

Apartado 18 – 0191 Lima 18, PERU
Mail : etica@iin.sld.pe - Comité de Ética / www.iin.sld.pe

APPENDIX D: Letters of permission for community kitchen leaders

INSTITUTE OF NUTRITIONAL INVESTIGATION

Av. La Molina 1885 (Ex Av. La Universidad 685) – La Molina

Tel.: (51-1) 349-6023 Fax: (51-1) 349-6025

RUC 20117792634

La Molina, 04 of September of 2007

Mrs. _____
President
Community Kitchens: _____
Present.-

Dear Mrs:

The purpose of this letter is to inform you and all other members of your board of the initiation of the project **"Participation in urban agriculture (UA) and its effects on food security and the nutritional status of the children of preschool age that live in the periphery district of Lima, Peru"**.

Who is doing this project?

The Institute of Nutritional Investigation (INI) is in charge of this project. This Institute is a private non profit organization dedicated to the investigation, teaching, training, Health and Nutritional services, which has been doing previous nutritional work in the area, jointly with other local organizations

Where will this project take place?

This Project will be done in the area of Nievería.

What is the objective of this project?

The principal objectives are:

- To know the role of urban agriculture on the food security in the home, the food and nutrition of the children of Nievería.
- To compile information about urban agriculture, the need to develop educational programs in respect to the food and nutrition needs of the children in this area.

What is going to be done with the community kitchens?

For this work, all the Community Kitchens of Nievería will be consider, even though their participation will be totally voluntary.

With your help and other members of your Board, we want to invite all mothers and children between the ages of 2 and 5 that go to Community Kitchens which you so ……...direct, to participate in this project.

We will only invite to this project the adult women In the Community Kitchens. If the mothers accept to participate, they will be visited at their homes where they will be interviewed and the nutritional status of the children will be evaluated (weight and height)

As you know, the Community Kitchens play a very important role in the nutrition of many families, and as a result of the community, and is because of this reason that we want you to participate in this project.

Thanking you in advance for your support and the interest you have demonstrated

Yours sincerely

APPENDIX E: Sociodemographic survey

INFORMACIÓN DEMOGRÁFICA Y SOCIOECONÓMICA, Y ANTROPOMETRÍA SECCIÓN 1A

1 Código de la encuestadora-niño 1

2 Fecha de la encuesta*(dd/mm/yy)* 2

3 Nombre de la encuestada: _____

4 Relación del informante al niñ*(madre = 01, abuela materna= 02, abuela paterna = 03, otro familiar adulto = 04, menor de edad = 05, otro = 77 especificar _____)* 4

5 Nombre del niño 5 _____

6 Dirección de la casa 6 _____

6a Actividad agropecuaria*(menos de 1 año=01, de 1 año a más=02, no=03)* 6a

ANTROPOMETRÍA

7a **Fecha que ha tomado peso y talla** 7a

7b Fecha de nacimiento del niñ*(dd/mm/yy)* 7b

8 Edad del niño***(meses)*** 8

9 Sexo del niño*(femenino = 01, masculino = 02)* 9

10 Peso del niño solo*(Kg.) (no corresponde = 88888)* 10 . .

11 Peso de la madre y niñ*((Kg.) (no corresponde = 88888)* 11 . .

12 Peso de la madre sola*(Kg.) (no corresponde = 88888)* **solo si el niño no se pesa solo** 12 . .

13 Niño *(11-12) (Kg.) (no corresponde = 88888)* 13 . .

14 Talla del niño*(cm.)* 14 . .

14a Talla de la madre*(cm.)* 14a . .

DATOS GENERALES DE LA MADRE/CUIDADORA

15 ¿Cuántos años tiene Ud.? (no sabe = 99) 15

16 ¿En qué departamento nació Ud.?_____ 16

* **(No dónde se criaba ni dónde pasaba mas tiempo, pero dónde se nació)**
(Lima Metro. y Callao = 01, Lima Sierra = 02, Sierra = 03, Selva = 04, Costa fuera de Lima = 05)

17 ¿En qué departamento nacieron sus padres?***(opciones arriba)***

a. Madre (Dpto.):_____ 17a

b. Padre (Dpto.):_____ 17b

18 ¿Hace cuánto tiempo Ud. vive en la zona? (años) 18 .

19 ¿Hasta que grado/año estudió Ud.? _____ 19
(solo años concluidos) *(no sabe = 99) (analfabeto = 01, primaria incompleta = 02, primaria completa = 03, secundaria incompleta = 04, secundaria completa = 05, superior técnico incompleta = 06, superior técnico completa = 07, superior universitario incompleta = 08, superior universitario completa = 09)*

19a Cual es su religión? _____ 19a
(católica = 01, evangélica = 02, marmona = 03, adventista = 04, cristianos = 05, mahanista = 06, otro = 77 especificar _____.

20 ¿Cuál es su estado civil? 20
(casada/conviviente = 01, separada/divorciada = 02, madre soltera = 03, viuda = 04, no sabe = 99)

21 ¿En su vida, cuántos hijos ha dado a luz? 21

21a De esos hijos ¿cuántos hijos viven? 21a
(total considerando todos sus compromisos y el niño en el estudio)

22 ¿Cuántos niños menores de 5 años tiene Ud.? (incluir al niño del estudio) 22

23 ¿Cuántos niños menores de 5 años viven en la casa? 23
(incluir los niños de la encuestada)

23a De esos niños, ¿Para cuántos de ellos es Ud la cuidadora principal? 23a

24 ¿A que se dedica usted?**(su ocupación principal)** _____ 24
(ama de casa = 01, agricultura en la casa/terreno propio = 02, otro trabajo en la casa = 03, jornalera = 04, labradora (ladrillos) = 05, otro trabajo fuera de la casa = 06, estudiante =07, nana =08, otro =77)

Especificar _____

24a ¿Ud. realiza otra actividad adicional? (sí = 01, no = 02) 24a

Si la respuesta es "sí":

Especificar _____

25 ¿Ud. vive actualmente con el padre del niño? (sí = 01, no = 02) 25

Si la respuesta es "no":

26 ¿Tiene actualmente pareja/esposo?*(sí = 01, no = 02, no corresponde = 88)* 26

***Si la respuesta de 25 o 26 es "sí" pasa a la pregunta 27; si es "no" para ambas preguntas pasa a la pregunta 36.**

DATOS GENERALES DE LA PADRE/PAREJA *(si la informante vive con pareja)

27 ¿En qué departamento nació el padre/pareja?_____ 27

(Lima Metro. y Callao = 01, Lima Sierra = 02, Sierra = 03, Selva = 04, Costa fuera de Lima = 05)

28 ¿Hace cuánto tiempo vive en la zona? **(años)** 28 .

29 ¿Hasta que grado/año estudió el? _____ 29

(solo años concluidos) *(no sabe = 99) (analfabeto = 01, primaria incompleta = 02, primaria completa = 03, secundaria incompleta = 04, secundaria completa = 05, superior técnico incompleta = 06, superior técnico completa = 07, superior universitario incompleta = 08, superior universitario completa = 09)*

30 ¿A qué se dedica él? **Especificar**_____ 30

(construcción = 01, labranza = 02, chofer de (moto) taxi = 03, agricultor/chacra = 04, chofer de combi = 05, fabrica = 06, otro = 77, no corresponde = 88, no sabe = 99)

31 ¿Esta trabajando actualmente, desde la semana pasada? 31

(sí = 01, no = 02, no corresponde = 88)

31a **Si la respuesta es "sí":** ¿Cuántos días por semana trabaja? 31a

31b **Si la respuesta es "no":** ¿Hace cuánto tiempo no trabaja? **(Anotar meses)** 31b

(<1 mes = 00, no corresponde = 88)

32 ¿Su trabajo/ocupación principal es fijo (01) o eventual (02)? *(no corresponde = 88)* 32

33 ¿Está en una planilla de pago? *(sí = 01, no = 02) (no corresponde = 88, no sabe = 99)* 33

34 ¿Su ingreso mensual es variable (01) o siempre es lo mismo (02)? *(no corresponde = 88)* 34

35 ¿Trabaja fuera de la casa? *(sí = 01, no = 02, no corresponde = 88)* 35

CARACTERÍSTICAS DEL HOGAR – SERVICIOS BÁSICOS

36 ¿La vivienda que ocupa es propia? *(propia=01, alquilada=02, parientes=03, otro=77, especificar _____)* 36

Si la vivienda es propia:

37 ¿Tiene Ud. título de propiedad? (si = 01, no = 02, no corresponde = 88, no sabe = 99, *otro = 77 especificar _____)* 37

38 ¿Cuántas personas viven/duermen habitualmente en su casa? 38

39 ¿Cuántas familias viven en su casa? 39

39a ¿Esas familias comparten la olla familiar con Ud.? 39a

(sí todos = 01, no = 02, algunos = 03, no corresponde = 88)

40 ¿Cuántas personas diariamente comparten su olla? 40

41 ¿Cómo alumbra su casa? *(vela = 01, lámpara = 02, luz "jalada" de poste/vecino = 03, luz eléctrica intradomiciliaria/corriente = 04, otro = 77 especificar _____)* 41

42 ¿De dónde obtiene el agua para:

a. cocinar? _____ 42a

b. lavar? _____ 42b

c. beber? _____ 42c

*(vecinos = 01, camión cisterna = 02, pozo **(well)** sin filtro = 03, pozo con filtro = 04, río o acequia **(irrigation ditch)** = 05, pilón público = 06, agua potable a la casa intermitente = 07, agua potable todo los días (SEDAPAL) = 08, otro = 77, especificar _____)*

43 ¿En dónde guarda el agua? _____

(todas posibilidades) *(olla=01, tinas (basins)=02, en balde, tacho o cilindro=03, bidón de* 43a

*boca angosta **(narrow)**=04, en tanque sin caño **(faucet)** funcional = 05, en tanque con caño* 43b

*funcional = 06, **no corresponde = 88,** otro=77)* 43c

44 ¿Qué hace con el agua antes de tomarla? **(todas posibilidades)** 44a

(nada/toma directamente= 01, hierve = 02, trata con lejía/cloro = 03, trata con otro = 04 44b

otro = 77 especificar _____, no corresponde = 88) 44c

45 ¿Dónde hace Ud. sus necesidades? (¿Podría describirme cómo es su baño?) 45

_____

*(campo abierto/cerro=01, basural **(garbage dump)**=02, directo al río=03, silo o letrina sin desagüe **(drainage)** = 04, letrina con pozo séptico = 05, letrina con drenaje al río = 06, silo o letrina conectada al desagüe = 07, water con agua y desagüe = 08, baño ecológico = 10, otro = 77 especificar_____)*

Si la respuesta es silo o letrina:

46 ¿Dónde esta ubicado/a? 46

(la chacra = 01, canal de riego = 02, acequia = 03, al lado de la casa = 04, cerro = 05, otro = 77 especificar _____, no corresponde = 88)

47 ¿Cuántas habitaciones hay en su casa? **(cuentan todas *que ocupa ella y su familia,* incluyendo la sala y la cocina si están separada por algo que no es temporal, no cuent: baño, no cuenta lugar para animales)** 47

48 ¿Dónde esta ubicada la cocina? *(fuera = 01, dentro de la casa en sala común = 02, en la cocina de la casa= 03, **no cocina = 88*, otro = 77* especificar** _____)* 48

49 ¿Qué combustible usa principalmente para cocinar el almuerzo o comida principal? 49

*(carbón=01, kerosén=02, gas = 03, electricidad = 04, leña = 05, **no cocina = 88*, otro = 77*** especificar _____)*

OBSERVACIONES DEL HOGAR

Observe y anote tipo de suelo de la vivienda *(la mayoría del área donde vive) (tierra = 01, cemento sin acabar* ***(unfinished)*** *= 02, cemento acabado = 03, madera = 04, loseta* ***(tile)****/parquet = 05, otro=77 _____.* 50

Observe/anota tipo de paredes *(estera* ***(straw mat)****/cartón = 01, madera = 02, adobe = 03, ladrillos apilados = 04, ladrillos sin acabar = 05, ladrillos o cemento acabado = 06, otro=77 especificar _____.* 51

Observe el piso de la sala/comedor y defin *(muy sucio con restos de alimento y heces de animales = 01, mas o menos limpio con basura pero sin heces = 02, limpio y recién barrido* ***(swept)*** *y sin basura = 03, no se puede ver = 99)* 52

RECURSOS

Tiene los siguientes artefactos? **(considerar "si" cuando es de su propiedad o cuando usa los artefactos de la familia, por ejemplo de sus padres y comparten la olla familiar)** *(si funcionando = 1, no = 2, si pero no funciona = 3, no sabe o prefiere no contestar = 99)*

53	Televisor	53
54	Radio	54
55	Equipo de sonido	55
56	Maquina de coser o tejer	56
57	Carro, mototaxi, moto	57
58	Refrigeradora	58
59	Licuadora	59
60	Teléfono o celular	60
61	Lavadora	61
62	Bicicleta, triciclo	62
63	Computadora	63

GASTOS EN ALIMENTOS

64 ¿Cuánto gasta Ud. diario en alimentos para toda las personas que comparte la olla familiar para TODAS las comidas del día? **Incluya desayuno, almuerzo, cena y los gastos de leche del niño)** *(no sabe = 099)* **(en soles)** 64 .

65 ¿Cuánto gasta Ud. a la semana adicionalmente a lo que Ud. gasta diario? **Si la respuesta es "nada" = 0000** *(no sabe = 99)* 65 .

66 Además de los gastos mencionados ¿Tiene Ud. otros gastos en alimentos, i.e. menú o comida fuera del hogar? *(sí = 01, no =02)* 66

66a **Si la respuesta es "sí"** ¿Cuanto? **(solo lo que gasta la entrevistada)** **Si la respuesta es "no tiene otros gastos" = 00000** 66a .

67 **Especificar si es diario (01), semanal (02), quincenal (03), mensual (04)** *(no corresponde = 88,* 67

68 ¿Recibe su hogar alimentos de provincia? *(sí = 01, no = 02)* 68

68a ¿Cuántas veces al año reciben alimentos de provincia? ***(no corresponde = 88)*** 68a

Especificar que tipos de alimentos reciben de provincia ***(no corresponde = 88)***

_____

69 ¿Sabe Ud. cuánto dinero aportan los otros miembros del hogar para alimentos destinados a su olla familiar? **Incluyendo el padre** *(sí/mas o menos = 01, no = 02)* 69

69a **Si la respuesta es "sí", especificar cuanto aportan (aprox.).** ***NA = 88888*** 69a .

69b **Especificar si es diario (01), semanal (02), quincenal (03), mensual (04)** ***NA = 88888*** 69b

70 ¿Sabe Ud. cuánto dinero gastan los otros miembros del hogar en comida fuera de la casa? **Incluyendo el padre** *(sí/mas o menos = 01, no = 02)* 70

70a **Si la respuesta es "sí", especificar cuanto gastan aprox.** ***NA = 88888*** 70a .

70b **Especificar si es diario (01), semanal (02), quincenal (03), mensual (04** ***NA = 88*** 70b

71 ¿Quién mantiene principalmente la casa/aporta principalmente para los gastos del hogar? **(en relación al niño)** *(padre/padrastro=01, madre=02, ambos=03, hermano/a = 04, hijo/a = 05, tío/a = 06, abuelo/a = 07, otro = 77, especificar _____)* 71

DECISIONES

Utiliza las siguientes opciones para esta sección:
(padre/padrastro = 01, madre = 02, ambos = 03, hermano/a = 04, tío/a = 05, abuelo/a = 06, otro = 77, especificar_____, no corresponde = 88,

72 En su hogar ¿quién decide sobre compras, por ejemplo si Ud. necesita un nuevo radio? 72

73 En su hogar ¿quién decide qué comprar para comer? 73

74 En su hogar ¿quién decide qué cantidad se va gastar en comida? 74

75 En su hogar ¿quién toma decisiones sobre gastos relacionados con la salud del niño? Por ejemplo si necesita medicinas. 75

SALUD-NUTRICIÓN DEL NIÑO

76 **Anote si la cuidadora tiene un carnet de salud (01) para el niño o si esta refiriendo la** 76

77 ¿Dónde nació el niño? _____ 77 ☐☐

(hospital = 01, EsSalud = 02, clínica = 03, centro de salud/posta = 04, casa con partera (midwife) = 06, casa con familiar o sola = 07, otro=77, no sabe=99,

78 ¿Cuánto pesó el niño al nacer? (Kg.)**(solicitar el carnet)**, *(no sabe=99)* 78 ☐☐.☐☐

79 ¿Está dando el pecho a su niño actualmente?*(si=1, no=2, no sabe=99)* 79 ☐☐

Si la repuesta es "no":

80 ¿Hasta qué edad le dio de lactar?**(en meses)** *(no corresponde = 88, no sabe=99)* 80 ☐☐

CONTROL DE SALUD-ENFERMEDAD

81 ¿Cuántas veces ha llevado a su niño al control del niño sano*(ninguna vez=00, no sabe=99)* **(Solicitar el carnet y anotar el numero de veces)** 81 ☐☐

Si la repuesta es ninguna vez, pasar a la pregunta 84

82 ¿Qué edad tenía el niño la ultima vez que lo llevo al E.S.**(en meses)** 82 ☐☐
(nunca lo llevo=77, no sabe=99) **(Si nunca lo llevo pasar a la pregunta)**

83 ¿Por qué le llevó?*(control = 01, vacunas = 02, consulta medica = 03, nutricionista = 04, otro=77 especificar_____, no procede=88, no sabe=99* 83 ☐☐

ESTADO DE SALUD ACTUAL DEL NIÑO

"Ahora vamos hablar sobre la salud de su niño la semana pasada."
****Si la cuidadora del niño contesta "si" a una pregunta, siempre confirmar que fue durante el periodo de 7 días de que hablamos.**

84 Durante la semana pasada (los 7 últimos día) ¿Fueron sus deposiciones/caquitas 84 ☐☐
normales? *(sí = 01, no = 02)*

Si la respuesta es "sí":

84a ¿Fueron normales todos los 7 días?*(si = 01, no = 02, no corresponde = 88)* 84a ☐☐

Si la respuesta es "no" para preguntas 84 o 84a:

84b ¿Qué tenia el niño?(diarrea = 01, estreñimiento = 02, otro = 77 especificar _____. *no corresponde = 88)* 84b ☐☐

Si la respuesta es "diarrea" (01):

84c ¿cómo fue? *(como agua/liquidas = 01, sueltos/semilíquidas = 02, no corresponde = 88, no recuerda/no sabe = 99, otro = 77 especificar_____)* 84c ☐☐

85 ¿Tuvo fiebre durante la semana pasada *(sí = 01, no = 02, no recuerda/no sabe = 99)* 85 ☐☐

86 ¿Tuvo tos durante la semana pasada *(sí = 01, no = 02, no recuerda/no sabe = 99)* 86 ☐☐

87 ¿Tuvo vómitos durante la semana pasada *(sí = anote el numero de vómitos, no = 00, no recuerda/no sabe = 99)* 87 ☐☐

88 ¿Cómo estuvo su apetito?*(normal = 01, algo bajo/comió poco = 02, rechazo todo = 03, no recuerda/no sabe = 99)* 88 ☐☐

(Si contesta que come poco, asegurar que eso es un cambio de normalidad)

CAPITAL SOCIAL

Asociaciones/organizaciones

89 ¿Ud. o alguien de su hogar recibe alimentos de algún programa/organización diferentes **del comedor popular?** *(sí = 01, no =02, no sabe = 99)* 89 ☐☐
Si la respuesta es "no" pasa a la pregunta 94 (Tabla 1.1

90 ¿De qué organización, programa o grupo recibe?_____ 90 ☐☐
(ONG = 01, MINAS = 02, Vaso de Leche = 03, colegio=04, no corresponde = 88, no sabe =99, otro = 77 especificar _____.

91 ¿Qué alimentos recibe?_____
(indicar todos en los cuadros 91a - 91d) 91a ☐☐
(solamente leche = 01, leche y avena = 02, mezcla fortificada = 03,atún o sardina = 04, arroz = 05, 91b ☐☐
menestras = 06, aceite = 07, no corresponde = 88, no sabe = 99, otro = 77 91c ☐☐
especificar _____) 91d ☐☐

92 ¿Para quiénes son estos alimentos?*(niño = 01, padres = 02, niño y hermanos = 03, toda la familia = 04, otro miembro del hogar = 77, no corresponde = 88, no sabe = 99* 92 ☐☐

93 ¿Quiénes consumen estos alimentos en su hogar?*(niño = 01, padres = 02, niño y hermanos = 03, toda la familia = 04, otro miembro del hogar = 77, no corresponde = 88, no sabe = 99)* 93 ☐☐

94 **PARA TABLA 1.1, las preguntas son las siguientes:**
COLUMNA A: ¿Sabe Ud. si existe un " X" en su área? *(sí = 01, no = 02, no sabe = 99)*
COLUMNA B: Si el grupo o asociación existe: En los últimos 12 meses:
¿ha Ud. participado en uno de estos grupos o asociaciones en su comunidad?"
COLUMNA C: "En los últimos 12 meses ¿ha sido Ud. un miembro o socio de este grupo o asociación?"
COLUMNA D: Especificar el tipo de participación o ayuda/apoyo:
(i.e.. soporte emocional, ayuda económica, consejos/recomendaciones, capacitación, educació

94	TABLA 1.1 (no corresponde = 88)		COLUMNA A: Existe en su área? (si=01, no=02, no sabe=99)	COLUMNA B: Participa? (si=01, no=02, no sabe=99)	COLUMNA C: Miembro o socio? (si=01, no=02, no sabe=99)	COLUMNA D: Especificar
94a	Vaso de Leche	94a				
94b	Comedor Infantil	94b				
94c	Donación de alimentos	94c				
94d	Club de madres/grupo de mujeres	94d				
94e	Asociación de la comunidad, cooperativa (Ej. Asociación de vecinas, JUR)	94e				
94f	Grupo religioso, parroquial	94f				
94g	Grupo deportivo/club social	94g				
94h	Asociación/comité de salud, agua, desarrollo, colegio (Wawawasi, APAFA)	94h				
94i	Otro (especificar) _____	94i				

95 En los últimos 12 meses ¿se ha unido a otros miembros de su comunidad par resolver un problema o trabajo juntos? *(sí = 01, no = 02, no corresponde = 88, no sabe = 99)* 95

96 En los últimos 12 meses ¿ha conversado con autoridades locales/representantes d gobierno acerca de un problema de la comunidad *(sí = 01, no = 02, no corresponde = 88, no sabe = 99)* 96

PRESTAMOS

97 ¿Tiene Ud. actualmente una deuda o ha recibido un préstamo? (si = 01, no = 02, no *corresponde = 88, no sabe = 99)* 97

Si la repuesta es "no", pasa a la pregunta 100

Si la repuesta es "si":

98 ¿A quién debe esta deuda o préstamo? (cosas grandes) _____ 98

(banco = 01, caja rural = 02, tienda de insumos bodega = 03, cooperativa = 04, tienda comercial = 05, proveedor de insumos (Ej. chacra/animales) = 06, familia/pariente = 07, otro medio informal = 08, ONG = 09, no corresponde = 88, otro = 77 especificar _____)

99 ¿Para que fue destinado el préstamo? _____ 99

(agrícola/pecuario = 01, negocios = 02, casa (artefactos/construcción) = 03, educación = 04, salud = 05, carro = 06, no corresponde = 88, otro=77 especificar _____

100 ¿Ud. saca fiado algún producto? (si = 01, no = 02, no corresponde = 88, no sabe =99) 100

100a ¿De dónde lo sacó? *(mercado local = 01, supermercado = 02, librería = 03, tienda de abarrotes = 04, farmacia = 05, gas = 06, otro = 77 especificar _____, no corresponde = 88)* 100a

CONFIANZA EN LA COMUNIDAD

101 En general ¿Cree Ud. que se puede confiar en la mayoría de personas de esta comunidad? *(sí = 01, no = 02, no procede = 88, no sabe = 99)* 101

102 ¿Se siente Ud. que es realmente parte de esta comunidad? *(sí = 01, no = 02, no procede = 88, no sabe = 99)* 102

En los últimos 3 años en la zona, alguien de su hogar ha sufrido:

103a Algún robo o hurto? *(sí = 01, no = 02, no procede = 88, no sabe = 99)* 103a

103b Alguna amenazas que les quita sus tierras *(sí = 01, no = 02, no procede = 88, no sabe = 99)* 103b

Si la respuestas son "no" para preguntas 103a y 103b pase a la pregunta 104

104 Cuando ocurrieron estos robos, amenazas de herencias, de tierras, etc., ¿Qué hizo Ud.? 104

(denuncio su caso a la comisaría = 01, hizo justicia por sus propias manos = 02, tomaron justicia con ayuda de sus vecinos = 03, nada = 04, otro = 77 especificar _____, no corresponde = 88, no sabe = 99)

105 ¿Ud. cree que se puede confiar en los autoridades (policías, serenazgos, etc.)? 105

(si = 01, no = 02, a veces = 03, no quiere contestar = 04, no sabe = 99)

CONOCIMIENTO DE NUTRICIÓN

"Ahora vamos a hablar sobre el tema de la nutrición y la alimentación"

106 ¿Qué alimentos cree Ud. que nos ayuda a prevenir la anemia? _____

_____

_____

107 ¿Qué alimentos cree Ud. que no debe faltar en la alimentación de un bebe de 8 meses? _____

_____

_____

107 ¿Qué alimentos cree Ud. que no debe faltar en la alimentación de un niño de 2 años? _____

_____

_____

108 Alimentos como las carnes, ¿Cómo cree Ud. que ayudan a los niños pequeños? _____

_____

_____

APPENDIX F: Urban agriculture survey

Project 257: Urban Agriculture, Gender & Nutrition — Institute for Nutrition Research

21/10/2007

URBAN AGRICULTURE SURVEY - Section 5

5.1 Mother-child i.d. 5.1 _____

5.2 Date of interview: 5.2 _____

5.3 Name of mother/caregiver: _____

5.4 Community Kitchen: _____

5.5 Relationship of informant: 5.5 ____

(1 = mother, 2 = grandmother, 3 = aunt, 4 = other adult family member, 5 = other child family member, 6 = neighbor, 77=other)

5.6 What type of production does the household engage in? 5.6 ____

(1 = crop cultivation, 2 = livestock rearing, 3 = both)

5.7 How long have you been doing UA? **years** 5.7.a ____

months 5.7.b ____

5.8 Does the household have agricultural land? 5.8 ____

(1 = yes, 2 = no)

5.9 What do you do with your agricultural land? 5.9 ____

(1 = cultivate, 2 = rent it out, 3 = in disuse, 77 = other, not applicable = 88)

ANIMAL REARING

5.10 ***What animals does your household raise? List of animals***

		Yes=01 No=02		How many ? Total			How are they used? Consumption.			Sale		
01	Chickens/roosters											
02	Chicks											
03	Guinea pigs											
04	Rabbits											
05	Ducks											
06	Turkeys											
07	Quails											
08	Cows/Bulls											
09	Sheep/ram/lamb											
10	Goats											
11	Pigs											
12	Horses/Mares											
13	Others											

5.11 From your animals, do you obtain products like?: **See list of products**

	Yes=01 No=02 N/A=88		How much do you obtain a day? (Total of units)			How do you use them? Consumption			Sale		
Chicken eggs											
Quail eggs											
Cow milk											

5.12 Of the animals that you breed, which is the one most consumed? Household consumption: 5.12 ____

Take the animal code that appears in question 5.10 (1-13)

Consider the family consumption on a regular diet

5.13 Of the animals that you raise, which one provides the most income? Sale: 5.13 ____

Use the animal code that appears on question 5.10 (1-13)

5.14 What type of food is given to the animals used for household consumption? Household consumption: 5.14a ____

(01= commercial concentration, 02=mineral sales, 03=sub products (molasses, grains),

04=residues of own kitchen, 05=residues of prepared food, 06=residues of farm

07=forage, 08=maize, 09=supplies, 77=other, specify_____, 88=not applicable)

5.14b ____

5.14c ____

5.14d ____

5.14e ____

5.15 What type of food is given to the animals that are used for sale? Sale: 5.15a ____

(Options above)

5.15b ____

5.15c ____

5.15d ____

5.15e ____

5.16 What sanitary treatment do the animals used for household consumption receive? Household consumption: 5.16a ____

(1=cows, 2=vitamins, 3=anti parasite, 4=all the previous, 5=veterinarian visits,

6=none given, 77=other, specify _____)

5.16b ____

5.16c ____

5.17 What sanitary treatment do the animals used for sale receive? Sale: 5.17a ____

(Options above)

5.17b ____

5.17c ____

5.18 Where do you keep your animals?

(1=back yard, 2=kitchen, 3=pond 4=cages, 5=pen, 6=farm, 77=other, specify _____)

Auto consumption: 5.18b ____

Sale: 5.18b ____

5.19 How much approximately, is your monthly for animals used for household _____

consumption? (99=unknown) Animal: _____ 5.19 [ ][ ][ ][ ].[ ]

5.20 How much approximately, is your monthly cost for animals destined for sale? ***(99=unknown)*** Animal: _____ 5.20 [ ][ ][ ][ ].[ ]

5.21 How much is the approximate monthly cost to look after all your animals? 5.21 [ ][ ][ ][ ].[ ]

Feeding [ ][ ][ ].

Transport (mainly for the buying of food) [ ][ ][ ].

5.22 How much money approximately, did you earn the last time you sold an animal? 5.22a [ ][ ][ ][ ].[ ]

(Specify the type of animal sold and the quantity)

Type of animal 5.22b [ ][ ]

Quantity sold 5.22c [ ][ ][ ]

5.23 How often do you sell one of your animals? 5.23 [ ][ ]

(01=daily, 02=weekly, 03=by weekly, 04=monthly, 05=every 3 months, 06 = every 6 months, 07=annually, 08=when needed, 77=other, 88=does not correspond, 99=unknown)

5.24 How much money approximately, do you make on the sale of eggs or milk? 5.24a [ ][ ][ ][ ].[ ]

(88 = does not correspond, 99=unknown)

Product ***(1=chicken eggs, 2=quail eggs, 3=milk)*** 5.24b [ ][ ]

NA = 8888 Quantity ***(g)*** 5.24c [ ][ ][ ].

5.25 How often approximately, do you sell your animal subproducts (milk and/or eggs)? 5.25 [ ][ ]

(01=daily, 02=weekly, 03=by weekly, 04=monthly, 05=every 3 months, 06 = every 6 months, 07=annually, 08=when needed, 77=other, 88=doe not correspond, 99=unknown)

5.26 What do you do with the money earned from sales?

_____

5.27 Who is in charge of:

	Activity	A Principal Person	B Other Person
	Animal for household consumption		
5.27.1	Acquisition of animal		
5.27.2	Purchasing of inputs		
5.27.3	Feeding		
5.27.4	Sanitary treatments		
5.27.5	Cleaning of facilities		
	Animal for sale		
5.27.6	Acquisition of animal		
5.27.7	Purchasing of inputs		
5.27.8	Feeding		
5.27.9	Sanitary treatments		
5.27.10	Cleaning of facilities		
5.27.11	Transportation		
5.27.12	Commercialization		

Persona:
01= Participant/mother/caretaker
02= Husband
03= Both
04= Another adult woman
05= Another adult male
06= Male child
07=Female child
77 =Other(Specify):_____)
88=Does not corresponded
99 = Unknown

5.28 What do you feel are the main benefits you have received from raising livestock? 5.28 [ ][ ]

(01=better education, 02=acquisition of goods, 03=family integration, 04=food security 05=emotional wellbeing, 06=does not recognize any benefits, 77=other, 99=unknown)

CULTIVATION

5.29 How did you obtained your land for cultivation the first time? 5.29 [ ][ ]

(01=bought, 02=renting, 03=agriculture reform, 04=transfer, 05=inheritance, 06=possession, 07=sharing 08=guardian, 77=other, 99=unknown)

5.30 Is the land you have now yours or rented? 5.30 [ ]

(1=own, 2=rented)

5.31 What is the surface of your land? ***(In Hectares)*** 5.31 [ ][ ].[ ]

5.32 Have you sold or do you sell any of your agriculture land? 5.32 [ ][ ]

(01 = yes, 02 = no, 99 = unknown)

5.33 What is the main reason for the selling, or for past sales of agriculture land? 5.33 [ ][ ]

_____

5.34 What have you done or are doing with the money you obtain through sales of your agricultural land? 5.34 [ ][ ]

_____

5.35 What type of agriculture are you currently doing? _____ 5.35 ☐☐

(01=conventional, 02=organic, 03=mixed, 77=other)

Organic agriculture: does not require chemical products

5.36 What do you cultivate? ***If you only cultivate grass survey is now finished***

		yes = 01	no = 02
01	Beets		
02	Lettuce		
03	Turnip		
04	Celery		
05	Zucchini		
06	Cabbage		
07			
08			

5.37 What crop do you primarily consume and in what area of your land is cultivated? **Crop** 5.37a ☐☐

Area (He) 5.37b ☐☐.

5.38 What crop do you primarily sell and in what area of your land is cultivated? **Crop** 5.38a ☐☐

Area (He) 5.38b ☐☐.

5.39 Are you associated with other people for the sale of your products? 5.39 ☐☐

(01 = yes, 02 = no, 88 = does not correspond, 99 = unknown)

5.40 For what purpose do you associate with this other person? _____ 5.40 ☐☐

5.41 Does any of your products have any type of transformation? 5.41 ☐☐

(01 = yes, 02 = no, 88 = does not correspond, 99 = unknown))

5.42 What product(s)? _____

5.43 How is it/are transformed? _____

5.44 Who is in charge of:

Activities	Principal Person		Other Person	
Agriculture				
Preparation of land				
Supplies Buying				
Seeding				
Watering				
Weeding				
Pesticide application				
Fertilizing application				
Harvest				
Process				
Transportation				
Commercialization				

Personnel:

01=Participant/mother/caretaker
02=Husband
03=Both
04= Another adult woman
05= Another adult male
06= Male child
07=Female child
77 =Other(Specify):_____)
88 =Does not correspond
99 =Unknown

5.45 When you need people for harvesting, who do you contract out? 5.45 ☐☐

(01 = paid female relative, 02 =non paid female relative, 03 =paid male relative,
04 = non paid male relative, 05=paid relatives of both sexes, 06=non paid relatives of both sexes,
07 =paid from both sexes, 08 =non paid from both sexes 09 = do not contract out,
77=other (specify) _____, does not correspond= 88)

5.46 What do you feel are the main benefits that engaging in crop cultivation have brought you ? 5.46 ☐☐

(01 = better education 02 = goods acquisition, 03 = family integration 04 = food security
05 = emotional wellbeing 06 = no benefits, 77 = other, 99 = unknown)

APPENDIX G: Household food security survey

SEGURIDAD ALIMENTARIA SECCION 4

Código de la encuestadora-niño ☐☐☐☐☐

Fecha de la encuesta ☐☐☐☐☐☐

Nombre de la Entrevistada ***(solo nombre, no apellidos)*** _____

Diga: ***"Ahora voy a hacerle algunas preguntas sobre los alimentos que ustedes consumen en casa".***

4.10	**¿Cual de las siguientes alternativas describe mejor la situación respecto a los alimentos en su casa,** en los últimos doce meses? **Lea las Alternativas:** 01 = Siempre comen lo suficiente y los alimentos que quieren → **Pase a pregunta 4.11** 1 02 = Comen lo suficiente pero no siempre lo que quieren → **Pase a pregunta 4.10.1** 03 = A veces no comen lo suficiente 04 = Frecuentemente no comen lo suficiente 77 = NS	4.1 ☐☐
4.10.1	**¿Por qué razón no comen los suficiente en casa?** **Lea las Alternativas:** (Puede responder mas de una razón) **Pregunta sí o no a cada alternativa**	sí = 01 no = 00 NA = 88
	1. No tienen suficiente dinero para alimentos	4.10.11 ☐☐
	2. Es difícil ir a la tienda	4.10.12 ☐☐
	3. Están a dieta	4.10.13 ☐☐
	4. No tienen una cocina que funcione	4.10.14 ☐☐
	5. No pueden cocinar/comer debido a problemas de salud	4.10.15 ☐☐
	6. No hay suficientes alimentos guardados para el año	4.10.16 ☐☐
	7. **Otro (especificar)** _____	
4.10.2	**¿Por qué razón no obtiene los tipos de alimentos que quisieran o necesitan?** **Lea las Alternativas:** (Puede responder mas de una razón) **Pregunta sí o no a cada alternativa**	sí = 01 no = 00 NA = 88
	1. No tienen suficiente dinero para alimentos	4.10.21 ☐☐
	2. Es difícil ir a la tienda	4.10.22 ☐☐
	3. Están a dieta	4.10.23 ☐☐
	4. No hay la clase de alimentos que quieren	4.10.24 ☐☐
	5. No hay buena calidad de alimentos	4.10.25 ☐☐
	6. Solo utilizan lo que guardan de la cosecha anterior	4.10.26 ☐☐
	7. **Otro (especificar)** _____	
4.11	En los últimos 12 meses **¿Ustedes se preocuparon porque los alimentos en casa se podrían acabar antes de poder conseguir mas?** **Encuestador, recuerde que:** "Casi todos los meses" = de 8 a 12 meses; "Algunos meses" = de 3 a 7 meses 01 = Sí, casi todos los meses 2 02 = Sí, algunos meses 1 03 = Sí, solo uno o dos meses → **¿Cuántos días pasó esto en el ultimo mes que ocurrió?** ☐☐ 04 = No ocurrió 77 = NS 88 = NA	4.11 ☐☐
4.12	En los últimos 12 meses, **¿Qué tan seguido ocurrió que los alimentos que consiguieron o compraron, NO duraron lo suficiente y NO había para conseguir o comprar mas?** ***No lea las alternativas, busca una respuesta espontánea.*** 01 = Sí, casi todos los meses 3 02 = Algunos meses 2 03 = Solo uno o dos meses 04 = No ocurrió 77 = NS	4.12 ☐☐

4.13 4 3	En los últimos 12 meses, ¿Ustedes tuvieron lo suficiente para comer alimentos variados o combinados (diferentes alimentos) que son buenos para la salud? 01 = Sí, casi todos los meses 02 = Algunos meses 03 = Solo uno o dos meses 04 = No ocurrió 77 = NS	4.13 ☐☐
4.14 5 4	En los últimos 12 meses, ¿Tuvieron que dar a los niños algunos alimentos mas baratos de lo que normalmente Ud. les da porque se les terminó lo que tenían y era difícil conseguir o comprar mejores alimentos? 01 = Sí, casi todos los meses 02 = Algunos meses 03 = Solo uno o dos meses 04 = No ocurrió 77 = NS	4.14 ☐☐
4.15 6 5	En los últimos 12 meses, ¿Qué tan seguido ocurrió que no tuvieran lo suficiente como para dar a los niños una alimentación variada (diferentes alimentos) y buena para la salud? 01 = Sí, casi todos los meses 02 = Algunos meses 03 = Solo uno o dos meses 04 = No ocurrió 77 = NS ¿Cuántos días pasó esto en el ultimo mes que ocurrió? ☐☐	4.15 ☐☐
4.16 7 6	En los últimos 12 meses, ¿Qué tan seguido ocurrió que sus hijos no comieron lo suficiente por falta de alimentos? *No lea las alternativas, busca una respuesta espontánea. 01 = Sí, casi todos los meses 02 = Algunos meses 03 = Solo uno o dos meses 04 = No ocurrió 77 = NS	4.16 ☐☐
4.17 8 7	En los últimos 12 meses, ¿Ud. o algún miembro de su hogar comió menos de lo que normalmente come o dejó de comer porque no había suficiente comida en casa? 01 = Sí 00 = No, 77 = NS ⟶ Pase a pregunta 4.18	4.17 ☐☐
4.17.1 8a 8	¿Qué tan seguido ocurrió esto? 01 = Casi todos los meses 02 = Algunos meses 03 = Solo uno o dos meses 77 = NS 88 = NA ¿Cuántos días pasó esto en el ultimo más que ocurrió? ☐☐	4.17.1 ☐☐
4.18 9 9	En los últimos 12 meses, ¿Comió Ud. menos de lo que pensaba que debía comer para estar sano (que es la ideal para Ud.) porque no había suficiente comida en casa? 01 = Sí, indique ¿Qué hace en esos casos?:_____ 00 = No 77 = NS	4.18 ☐☐
4.19 10 10	En los últimos 12 meses, ¿Alguna vez tuvo hambre pero no comió porque no había suficiente comida en casa? 01 = Sí, indique ¿Qué hace en esos casos?: _____ 00 = No 77 = NS	4.19 ☐☐
4.20 11 11	En los últimos 12 meses, ¿Bajó Ud. de peso porque no tuvo suficiente comida para consumir? 01 = Sí 00 = No 77 = NS	4.20 ☐☐
4.21 12 12	En los últimos 12 meses, ¿Ud. o algún otro adulto en su hogar dejó de comer todo el día porque no había suficiente comida en casa? 01 = Sí 00 = No, 77 = NS ⟶ Pase a pregunta 4.22	4.21 ☐☐
4.21.1 12a 13	¿Qué tan senguido ocurrió esto? 01 = Casi todos los meses 03 = Solo uno o dos meses 88 = NA 02 = Algunos meses 77 = NS	4.21.1 ☐☐
4.22 13 14	En los últimos 12 meses, ¿Alguna vez les dio menos cantidad de comida a sus hijos porque no había suficiente comida en casa? 01 = Sí 00 = No, 77 = NS ⟶ Pase a pregunta 4.24	4.22 ☐☐
4.23 14 15	En los últimos 12 meses, ¿Alguno de sus hijos dejó de comer porque no había suficiente comida en casa? 01 = Sí 00 = No, 77 = NS ⟶ Pase a pregunta 4.24	4.23 ☐☐

4.23.1 14a 16	**¿Qué tan seguido ocurrió esto?** 01 = Casi todos los meses 02 = Algunos meses 03 = Solo uno o dos meses 77 = NS 88 = NA **¿Cuántos días pasó esto en el ultimo mes que ocurrió?** ☐☐	4.23.1 ☐☐
4.24 15 17	<u>En los últimos 12 meses</u>, **¿Alguno de sus hijos tuvo hambre pero en su casa no había más comida para darle?** 01 = Sí 00 = No 77 = NS	4.24 ☐☐
4.25 16 18	<u>En los últimos 12 meses</u>, **¿Alguno de sus hijos no comió nada en todo el día porque no había alimentos en casa?** 01 = Sí 00 = No 77 = NS	4.25 ☐☐
4.26 17	**¿Para cuánto tiempo considera Ud. que tiene asegurada la comida para su hogar?** <u>LEA TODAS LAS ALTERNATIVAS:</u> 01 = Vive al día 02 = Para una o 2 semanas 03 = Para un mes 04 = Para medio año 05 = Para un año o más **Si la entrevistada da otra respuesta, marca la opción más cerca y agrega un comentario*	4.26 ☐☐
4.27 18	**¿Cuál es su mayor preocupación frente a la falta de alimentos?** <u>LEA TODAS LAS ALTERNATIVAS:</u> 01 = No saber si tendrá suficiente dinero 02 = No tener acceso a alimentos de calidad 03 = Factor asociado al clima 04 = No tengo ninguna preocupación 05 = Otro (Especificar):_____	4.27 ☐☐
4.28 19	**En general, ¿la posibilidad de conseguir alimentos para su hogar varia durante el año?** <u>LEA TODAS LAS ALTERNATIVAS:</u> 01 = Sí, por razones económicas/escasez de trabajo 02 = Sí, por falta de alimentos 03 = Sí, otras razones (especifique): _____ 04 = No 77 = NS	4.28 ☐☐
4.29 20	**Principalmente, ¿qué hace Ud. cuando en su casa no hay suficiente para comer?** <u>LEA TODAS LAS ALTERNATIVAS:</u> 01 = Va al Comedor y compra comida 02 = Va al Comedor y pide fiado 03 = Pide dinero prestado a su vecina o familiar 04 = Diminuye raciones o deja de comer 05 = Va donde un familiar para que le de comida 06 = Va a la tienda y pide fiado 07 = Nunca ocurre 08 = Otro (Especificar):_____	4.29 ☐☐
4.30 21	**¿Cuál es la razón <u>principal</u> por la que Ud. va al Comedor?** 01 = Para complementar sus raciones 02 = Porque es barato 03 = Porque no tiene tiempo para cocinar 04 = Porque no hay quien cocine en casa 05 = Porque no tiene cocina en casa 06 = Otro (Especificar):_____ 88 = NA	4.30 ☐☐
4.31 22	<u>En los últimos 12 meses</u>, **¿sus hijos han consumido lo que da el Vaso de Leche <u>en la zona?</u>** 01 = Sí, casi todos los meses 02 = Sí, algunos meses 03 = Sí, solo uno o dos meses 04 = No ocurrió ⟶ <u>Pase a pregunta 4.33</u> 77 = NS ⟶ <u>Terminó esta sección</u>	4.31 ☐☐
4.32 23	**¿Cuál es la razón <u>principal</u> por la que sus hijos consumen lo que da el Vaso de Leche?** 01 = Porque la leche es irremplazable 02 = Para complementar sus alimentación 03 = Otro (especifique): _____ 88 = NA ⟶ <u>Terminó esta sección</u>	4.32 ☐☐
4.33 24	**¿Cuál es la razón <u>principal</u> por la que Ud. n<u>o asiste al Vaso de Leche</u>?** 00 = No hay Programa de Vaso de Leche en la zona 01 = No tiene tiempo 02 = No percibe ningún beneficio 03 = No lo necesito 04 = No tiene niños/as de la edad requerida por el Programa 05 = No admiten nuevas socias 06 = Existen problemas de la organización 07 = Otro (Especificar): _____	4.33 ☐☐

APPENDIX H: Food frequency questionnaire

Código de la encuestadora-niño

Fecha

Frecuencia de Consumo de Alimentos SECCIÓN 3

Nombre de la madre: _____

Comunidad: _____

Comedor Popular: _____

crianza propia = 01, crianza de otro = 02, chacra propia =03, chacra de otro = 04, tienda o bodega propia = 05, otra tienda/bodega = 06, mercado local = 07, mercado de otra zona = 08, comedor popular=09, vendedor ambulante=10,encomienda =11,guarderia=12, comedor infantil=13, escuela/ colegio = 14, otro = 77 especificar _____

Diga: ***"Ahora voy a preguntarle sobre los alimentos que consumió su niño(a) en casa en los últimos 7 días".***

No.	Alimento	Diario	Inter-diario	Veces a la semana	Cuántos veces al día?	Nunca le ha dado	Lugar de procedencia	Observaciones
1	Hígado de pollo/gallina							
2	Molleja de pollo							
3	Sangre de pollo							
4	Carne de pollo							
5	Carne de res							
6	Carne de carnero							
7	Bofe de carnero							
8	Bazo de res (carne no caldo)							
9	Pescado							
10	Atún o pescado en conserva							
11	Cuy							
12	Huevo							
13	Lentejas							
14	Otra menestra (arvejas secas)							
15	Zanahoria							
16	Zapallo							
17	Espinaca							
18	Betarraga							
19	Acelga							
20	Brócoli							

APPENDIX I: Adapted version of USDA Food Insecurity and Hunger Module – Abridged [29]

Q	I	QUESTION
1		*Which of the following statements better describes the food situation at your home in the last twelve months?*
2	**1**	*In the last 12 months, have you been worried because food at home could run out before you could get more?*
3	**2**	*In the last 12 months, how often did it happen that the food you bought/obtained did not last enough time and there was no money to obtain more?*
4	**3**	*In the last 12 months, did you have enough to eat varied or combined meals?*
5	**4**	*In the past 12 months, did you have to feed your children with lower-cost food than usual because food run out at home and there was difficult to buy/obtain higher-cost food?*
6	**5**	*In the last 12 months, how often did it happen that you did not have enough to feed your children with varied, combined and healthy meals?*
7	**6**	*In the last 12 months, how often did it happen that your children did not have enough to eat due to lack of food at home?*
8	**7**	*In the last 12 month, did you or other adult have to eat less than usual or not eat because there was not enough food at home?*
8a	**8**	*How often did this happen?*
9	**9**	*In the last 12 months, did you eat less than you thought you should to be healthy because there was not enough food at home?*
10	**10**	*In the last 12 months, were you ever hungry but did not eat because there was not enough food at home?*
11	**11**	*In the last 12 months, did you lose weight because you did not have enough food to eat at home?*
12	**12**	*In the last 12 months, your or other adult at home did not eat the whole day because there was not enough food at home?*
12a	**13**	*How often did this happen?*
13	**14**	*In the last 12 months, did you have to reduce your children's food portions because there was not enough food at home?*
14	**15**	*In the last 12 months, did any of your children have to not eat because there was not enough food at home?*
14a	**16**	*How often did this happen?*
15	**17**	*In the last 12 months, did any of your children go hungry but there was no more food at home?*
16	**18**	*In the last 12 months, did any of your children did not eat the whole day because there was not food at home?*
17		*For how long do you think you have the food for your family guaranteed?*
18		*What is your biggest concern regarding lack of food?*
19		*In general, your family's food access varies throughout the year?*
20		*What do you do when there is not enough to eat at home?*
21		*What is the main reason you go to the Communal Kitchen Program?*
22		*In the last 12 months, did you go to the Glass of Milk Program in your area?*
23		*What is the main reason you go to the Glass of Milk Program?*
24		*What is the main reason you do not go to the Glass of Milk Program?*

Note: "Q" refers to the chronological item numbering in the original questionnaire and "I" refers to the item number used to calculate the food insecurity indicators and scale. Scale results were based on the eighteen items labelled "1" to "18" in column "I" [21].

APPENDIX J: Food security scale values and status levels

Status levels correspond to Number of Affirmative Responses (Adapted from Guide to Measuring Household Food Security 2000 – incorporating new labels for status levels)

Number of Affirmative Responses:		**1998 Food Security Scale Values**	**Food Security Status Level**	
(Out of 18) **Households with children**	(Out of 10) **Households without children**		**Code**	**Category**
0	0	0.0	0	Food Secure
1		1.0		
	1	1.2		
2		1.8		
	2	2.2		
3		2.4		Marginally Food Secure
4		3.0		
	3	3.0	1	
5		3.4		
	4	3.7		
6		3.9		
7		4.3		
	5	4.4		
8		4.7		Low Food Security
	6	5.0		
9		5.1		
10		5.5	2	
	7	5.7		
11		5.9		
12		6.3		
	8	6.4		
13		6.6		Very Low Food Security
14		7.0		
	9	7.2		
15		7.4	3	
	10	7.9		
16		8.0		
17		8.7		
18		9.3		

(Adapted from Bickel et.al, 2000)

APPENDIX K: Levels of food security and definitions (adapted USDA Guide for Measuring Household Food Security Revised, 2000)

Level 1:Food secure

Defined as: Households show no or minimal evidence of food insecurity.

Level 2-4: Food insecure

- **Level 2: Marginally food secure**
  Defined as: Food insecurity is evident in household members' concerns about adequacy of the household food supply and in adjustments to household food management, including reduced quality of food and increased unusual coping patterns. Little or no reduction in members' food intake is reported.
- **Level 3: Low food security**
  Defined as: Food intake for adults in the household has been reduced to an extent that implies that adults have repeatedly experienced the physical sensation of hunger. In most (but not all) food-insecure households with children, such reductions are not observed at this stage for children.
- **Level 4: Very low food security**
  Defined as: At this level, all households with children have reduced the children's food intake to an extent indicating that the children have experienced hunger. For some other households with children, this already has occurred at an earlier stage of severity. Adults in households with and without children have repeatedly experienced more extensive reductions in food intake.

APPENDIX L: Market prices of livestock in Eastern-Cone of Lima, Peru

Table: Current market prices for different types of animals being raised in the peri-urban communities of Lurigancho-Chosica[1]

Animal	Price per kg body weight or unit	Average weight	Price per unit (soles)
Hen[2]	12 soles / 1.5 kg	1.5 kg	18
Chicken	7 soles / 1.0 kg	1.0 kg	7
Guinea pig	10 soles / unit	NA	10
Rabbit	30 soles / unit	NA	30
Ducks/Geese	11 soles / 1.0 kg	2.0 kg	22
Turkeys	11 soles / 1.0 kg	11.4 kg	125.4
Quails	10 soles / unit	NA	10
Sheep	5.5 soles / 1.0 kg	60 kg	330
Goat	5.5 soles / 1.0 kg	35 kg	192.5
Pig	5.5 soles / 1.0 kg	50 kg	275
Horse	5.5 soles / 1.0 kg	454 kg	2497

[1] Exact prices were provided for hens, chickens, guinea pigs, ducks and pigs which were used to estimate the prices for the remaining animals; [2] Hens are different than chickens in that hens are larger and are generally kept for producing eggs, while chickens are smaller and are raised for their meat;