Residence in a Deprived Urban Food Environment:

Food Access, Affordability, and Quality in a Paraguayan Food Desert

by

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ABSTRACT

Food deserts are the collection of deprived food environments and limit local residents from accessing healthy and affordable food. This dissertation research in San Lorenzo, Paraguay tests if the assumptions about food deserts in the Global North are also relevant to the Global South. In the Global South, the recent growth of supermarkets is transforming local food environments and may worsen residential food access, such as through emerging more food deserts globally. This dissertation research blends the tools, theories, and frameworks from clinical nutrition, public health, and anthropology to identify the form and impact of food deserts in the market city of San Lorenzo, Paraguay. The downtown food retail district and the neighborhood food environment in San Lorenzo were mapped to assess what stores and markets are used by residents. The food stores include a variety of formal (supermarkets) and informal (local corner stores and market vendors) market sources. Food stores were characterized using an adapted version of the Nutrition Environment Measures Survey for Stores (NEMS-S) to measure store food availability, affordability, and quality. A major goal in this dissertation was to identify how and why residents select a type of food store source over another using various ethnographic interviewing techniques. Residential store selection was linked to the NEMS-S measures to establish a connection between the objective quality of the local food environment, residential behaviors in the local food environment, and nutritional health status. Using a sample of 68 households in one neighborhood, modeling suggested the quality of local food environment does effect weight (measure as body mass index), especially for those who have lived longer in poorer food environments. More generally, I find that San Lorenzo is a *city-wide* food desert, suggesting that research needs to establish more nuanced categories of poor food environments to address how food environments emerge health concerns in the Global South.

DEDICATION

For my Grandparents, Harry, Hazel, and Charlee, who always supported me, but who passed away before they could see me complete my “lessons.”

And, for my Mom and Dad

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TABLE OF CONTENTS

CHAPTER Page

LIST OF TABLES

Table		Page

Table Page

LIST OF FIGURES

Figure Page

Chapter 1

INTRODUCTION

In the early 1990s, the UK (United Kingdom) Low Income Project Team noticed that neighborhoods with poor access to supermarkets had population trends in obesity (Beaumont, Lang, Leather, & Mucklow, 1995). The research team interviewed a number of residents about their perceived access to food stores. One elderly and lower income resident said that trying to access healthy food in her neighborhood was “like living in a desert” because there were no stores within walking distance where she could purchase the foods she needed to prepare her meals (Beaumont, Lang, Leather, & Mucklow, 1995). From this metaphor, the UK Low Income Project Team first coined the term, “food deserts.” Today, the commonly used definition of a food desert is an area in the food environment where people lack access to reasonably priced, nutritious food (Cummins, Smith, et al., 2010; Gallagher, 2006; Wrigley, Warm, et al., 2003; Wrigley, Warm, et al., 2002). This lack of access to reasonably priced, nutritious food denies residents the necessary resources for health.

The purpose of this Global Health dissertation is to test assumptions concerning food deserts from the Global North using one case example from the Global South. This dissertation research is novel and important because my research implies that food deserts exist in the Global South, yet no empirical evidence provides support for food deserts in the Global South. Nor is there evidence to support if the impacts on individuals who reside in food deserts are the same (or even worse) in the Global South as compared to the Global North. A perspective in global health must operate to promote social and economic equity, and the reduction of health disparities that cross local, international, and global health issues, such as the development of food deserts among the urban poor. In 2009, I explored San Lorenzo, Paraguay to identify a possible food desert. In 2010, I investigated how a food desert functions in San Lorenzo by testing the primary hypotheses from the existing food desert literature based in the Global North.

Global Health Perspective

The broader objectives of this research are the identification and reduction of risk factors derived from global impacts within local communities (Bozorghmer, 2010; Janes & Corbett, 2009). Global Health research blends the tools, theories, and frameworks from epidemiology, public health, and the social sciences to combat new forms of disease and health disparities (Bozorghmer, 2010; Janes & Corbett, 2009; McMichael & Beaglehole, 2000; Spiegel, Labonte, & Ostry, 2004). This perspective monitors, manages, and provides information for the improvement of health issues that cross international borders (Fried, et al., 2010; Kickbush, 2002; Koplan, et al., 2009; Szlezák, et al., 2010). Thus, the research seeks to identify the point of the global/local convergence so that interventions can be implemented that improve the health of the populations involved (Fried, et al., 2010; Szlezák, et al., 2010). The ethical appeal of the global health perspective is that it works to maintain health security and health access for all populations regardless of social or economic circumstance (Koplan, et al., 2009).

Globalization has been defined as the process of international integration that connects cities into one large network in the exchange and trade of manufactured goods, cultural and scientific knowledge, and disease (Bauman, 1998; Beck, 2000; Giddens, 2000; Robertson, 1992). Globalization can result in countries experiencing unbridled capitalism (Ritzer, 2004). Thus, at the extremes, globalization may result in the transnational expansion of common goods and practices, known as homogeneity, or the hybridization of global and local cultural inputs, known as heterogeneity (Robertson, 1992). When choice and opportunity homogenizes local environments, individual vulnerability (or a lack of resilience) to global forces can negatively impact human health (Frenk, et al., 2010; Koplan, et al., 2009; McMichael & Beaglehole, 2000; Szlezák, et al., 2010). The term *globalization* is often interchanged with the term *global processes* (Janes & Corbett, 2009; Kickbush, 2002; Koplan, et al., 2009). Global processes are those events that impact the environment as a whole (Janes & Corbett, 2009; Kickbush, 2002; McMichael & Beaglehole, 2000). They are complex, diverse events that are considered to be temporally unstable (Janes & Corbett, 2009; McMichael & Beaglehole, 2000). As a result they often converge in an issue or outcome on a local, national, and/or global scale (Bozorghmer, 2010; Janes &

Corbett, 2009). When these processes interact, such as the global and local trade of food, then a new concept is seen, known as the concept of *glocalization*, or the *glocal* (Robertson, 1992). One area where the concept of glocalization may be apparent is that of the food desert; although, little research on this point currently exists.

Food Deserts in the Global North and Global South

A global division between wealthy, developed countries and poorer, lesser developed countries exists, based on the level of economic development and gross national product and used to explain world poverty (Thérien, 1999). Most notably, research between the Global North and the Global South focuses on financial and international trade flows (Jones, 1983; Lake, 1987). The Global North is synonymous with industrialization and the Global South is its opposite (ul Haq, 1995). However, the use of a geographic paradigm is somewhat inaccurate. For example, countries of the Global North include the United States, Canada, and the United Kingdom, which are located in the northern hemisphere; but, the Global North also include New Zealand and Australia, which are located in the southern hemisphere.

Food deserts are the collection of deprived food environments (Cummins, et al., 2010; Farley, Rice, Bodor, Futrell, & Rice, 2010; Freedman, 2009; Macdonald, Ellaway, & Macintyre, 2009; Wrigley, Warm, & Margetts, 2003). Currently, all food deserts that have been identified are located in the Global North. A series of published case studies from Australia, Canada, New Zealand, the United States, and the United Kingdom have identified food deserts in lower income neighborhoods in urban areas. When shopping for food in these neighborhoods, residents were forced to make a decision between buying "economical" versus "healthy" foods (Cummins, et al., 2010; Dibsdall, Lambert, Bobbin, & Fewer, 2003; Macintyre, Macdonald, & Ellaway, 2008; Rose & Richards, 2004; Winkler, Turrell, & Patterson, 2006). Researchers explain that food deserts and their subsequent shopping dilemmas emerge from social exclusionary practices by municipal planning committees which discourage healthy and affordable food stores from developing in lower income neighborhoods (Papas, et al., 2007; Rundle, Diez Roux, & Freeman, 2007; Wrigley, 2002).

No food deserts have been identified in the Global South, most likely because little (if any) research has been done. Most people in the Global South (Latin and South America, Africa, and South East Asia) rely on an informal economy for income, food, health care, and shelter (Freire, 2005; Hall, 2005). Because of the informality of the resource supply chains, those in the Global South are impacted greatly when there is scarcity or a greater cost for essentials (Evers 1994; Plattner 1985; Pottier 1999). Unlike the Global North, no municipalities, city services, or planning committees exist so political power and the exclusionary infrastructure do not impact the Global South (Hall, 2005). Thus, the methods used in current research protocols to determine food deserts from food environments in the Global North must be modified to identify food deserts in the Global South.

One definition of food desert is a deprived area in the food environment where people lack access to reasonably priced, nutritious food (Cummins, et al., 2010; Gallagher, 2006; Wrigley, Warm, et al., 2003; Wrigley, Warm, et al., 2002). Researchers characterize food deserts by population socio-economic status (SES) and significant environmental attributes: walkability, availability, affordability, and quality of local food stores (Hemphill, Raine, Spence, & Smoyer-Tomic, 2008; Inglis, Ball, & Crawford, 2008; Latham & Moffat, 2007; Macintyre, Macdonald, & Ellaway, 2008). Typically, supermarkets are considered the best source of nutrition when compared to other types of food stores (Cummins, Smith, et al., 2009; Freedman & Bell, 2009; Glanz, Sallis, et al., 2007). Food deserts often lack supermarkets or contain stores which offer little fresh produce or healthy food items in close proximity to residents (Cummins, Smith, et al., 2010; Gallagher, 2006; Moore & Diez-Roux, 2006; Shaw, 2006; Whelan, Wrigley, Warm, & Cannings, 2002). When food deserts do contain food stores offering healthy foods, the prices of these foods are more expensive than the less healthy offerings (Beaulac, Kristjansson, & Cummins, 2009; Drewnowski, 2004; Inagami, Cohen, Finch, & Asch, 2006; Macintyre, Macdonald, & Ellaway, 2008; Rose & Richards, 2004).

Census areas, such as a block or track, enable the investigation of a top down approach to sampling city areas and linking residential to commercial land use (Bertrand, Therien, & Cloutier, 2008; Freedman, 2009; Moore & Diez-Roux, 2006; Moore, Roux, Nettleton, & Jacobs, 2008; Sharkey, Horel, Han, & Huber, 2009). In the Global North, food deserts develop as a result of social exclusionary practices at the city level (Wrigley, 2002). Succinctly stated, when municipalities plan for commercial use of an area, then people will engage in economic activities; when municipalities plan for residential use of an area, then people will reside there and engage in household activities. The underlying assumption about human agency in city environments suggests that people use and access resources in physical landscapes because the land is built, created, or planned for that type of use (Chen & Florax, 2010).

For example, researchers compared census tracts and their food stores across US cities in California and Louisiana (Farley, et al., 2009). The researchers used both secondary sources to find store listings and they conducted a windshield survey along every street in over 200 census tracks to identify any stores missing from city store listings. Next, researchers contacted every store and measured (in meters) the amount of shelf space devoted to “healthy” (fruits and vegetables) and “unhealthy” (sweetened beverages and salty and sweet snacks) foods. Findings revealed that chain supermarkets and about half of the smaller, independent grocery stores (with up to three cash registers) sold fruits and vegetables; however, chain supermarkets devoted more of their shelving to fresh fruit than in the independent stores (Farley, et al., 2009, p. 675-676).

Compared with chain convenience stores, supermarkets had 30 times more fresh fruits and vegetables (Farley, et al., 2009, p. 676). Researchers concluded that a full assessment of the food environment requires a representative sample and analysis of all food retailing stores in local census areas and not just chain supermarkets (Farley, et al., 2009).

In another US-based study, researchers focused on store inventories in all store types surrounding three Boys and Girls Clubs near public housing projects in Tennessee (Freedman, 2009). They used the Boys and Girls Clubs as a census landmark and proxy for deprived neighborhoods because Boys and Girls Club serve communities characterized by ethnic minorities, poverty, and one parent, lower educated households. The study found that two of the neighborhoods had a supermarket within a mile; however, in the most densely populated neighborhood, residents lacked any supermarket (Freedman, 2009, p. 388). Specifically, researchers found that 70% of the smaller stores sold at least one fresh fruit (usually oranges, bananas, or apples), 80% of the smaller stores did not have any fresh vegetables, and the two supermarkets, overall, sold a wider variety of both fruits and vegetables (Freedman, 2009, p. 288). However, in terms of walkable access, the stores closest to the Boys and Girls Clubs primarily stocked more snack foods, tobacco, and alcohol products than fruits and vegetables; hence, revealing that where one lives is strongly associated with one's ability to access healthy foods (Freedman, 2009). Thus, local improvements in store inventories must occur to increase residential access to healthier foods.

Urban planners define a walkable distance as ½ mile (Gallagher, 2006). Typically, researchers use a walking distance greater than ½ mile from residential neighborhoods to a supermarket as an indicator of a possible food desert (Gallagher, 2006; Nicholls, 2001; Rundle, Neckerman, et al., 2009; Talen, 2003), particularly when residents lack reliable access to transportation, via personal vehicles or reliable bus transportation (Burns & Inglis, 2007; Lopez-Zetina, et al., 2006; Pendola & Gen, 2007; Townshend & Lake, 2009). Thus, the Tennessee study (Freedman, 2009) finds that residents that live around the Boys and Girls Clubs live in a food desert.

In Montreal, researchers randomly sampled households and stores within census tracts across the city to identify a relationship between deprivation and food store access. Researchers were unsure of how to operationalize deprivation, so they used three approaches, including mapping low income levels, administering a standard deprivation index, and performing a factor analysis on various socioeconomic indicators (e.g., single parent homes, low educational attainment, unemployment, and immigration status). The researchers found that the results between these indicators were similar and concluded that deprivation can be identified in any one of those indicator categories (Apparicio, Cloutier, & Shearmur, 2007).

They also found that tracts classified as deprived and with low accessibility to supermarkets are on average greater than ½ mile (approximately 1.34 kilometers) in walking distance, so food deserts exist in Montreal; however, they explain that food desert areas are present in isolated cases and do not represent a city-wide health concern (Apparicio, Cloutier, & Shearmur, 2007, p. 9). Incidentally, they identify that the most deprived areas also have high immigrant populations and that in these areas residents have access to culturally distinct and ethnic grocery stores that may provide fresh fruits and vegetables to improve residential access; however, the analysis only included large retailing and chain supermarkets and not the smaller, more localized stores, which limits their research findings.

In Scotland, researchers also employed a standard deprivation index with seven domain indicators including income, employment, geographic access to transportation, incidence of high health concerns and issues, lower education, higher crime, and poorer housing materials (Cummins, Smith, et al, 2010). Across neighborhoods, researchers found that as deprivation increases the availability of fruits and vegetables and the store sizes decrease. They found that medium and larger sized stores had almost perfect availability of the fruits and vegetables as surveyed in stores. They found a pattern of decreasing prices for fruits and vegetables as store size increases; however, the general price was not affordable among the most deprived residents (Cummins, Smith, et al, 2010).

Additionally, researchers found both fruit (p=0.002) and vegetable (p=0.0002) items were significantly less available in more deprived neighborhoods (Cummins, Smith, et al, 2010, p. 498). Researchers conclude that as more deprived areas emerge in city landscapes, the size and availability of food retailing stores diminish and deny local residents equal access to affordable foods.

In Glasgow City, Scotland, another study used the national register to identify deprived neighborhoods. The register included a series of indictors, including information on income status, financial welfare and assistance status, and access to city transportation (bus and subway stops) and city structures (schools and universities, libraries, emergency services and hospitals, waste disposal centers, recreational and entertainment facilities, post offices, and food retailing stores). Researchers found that as deprivation increased, access to city services decreased, except for food retailing sources. Researchers found that nearly a third of the fast food chains were located in more deprived areas; so, in deprived city areas, residents had some form of access to food stores (Macintyre, Macdonald, & Ellaway, 2008, p. 910).

A limitation in the Glasgow City study is that researchers did not measure the quality of the food stores and cannot establish if more deprived residents have access to poorer quality stores, as the research may suggest, since access to all other services diminish with lower income status (Macintyre, Macdonald, & Ellaway, 2008, p. 911-912). In sum, they conclude that variations between stores must be established. Furthermore, they conclude that researchers must take a more nuanced, context and resource specific view in the distribution of food stores as well as city infrastructure and facilities (Macintyre, Macdonald, & Ellaway, 2008).

To determine the quality and variety of available food offerings among food stores requires a scale to effectively distinguish diversity of the food environment (Glanz, Sallis, Saelens, & Frank, 2007; Lytle, 2009; McKinnon, Reedy, Morrissette, Lytle, & Yaroch, 2009; Shaw, 2006). The scale must be reliable, valid, and result in a distribution of values that allow a rank ordering of food environmental attributes (Lytle, 2009). The scale must measure the varieties of foods available, along with their price and quality (Glanz, Sallis, Saelens, & Frank, 2007; McKinnon, Reedy, Morrissette, Lytle, & Yaroch, 2009). Then researchers must draw comparisons among the food store measures and the other neighborhood parameters deduced from the environment, for example, walkability relative to residential SES levels (Lytle, 2009; Shaw, 2006). If foods stores within a walkable distance supply poorer quality food, or are missing completely from the environment, then the food environment qualifies as a food desert (Shaw, 2006).

The Nutrition Environment Measures Survey for Stores (NEMS-S) assesses the quality, variety, and affordability of local food retailing stores with high reliability and validity (Glanz, Sallis, Saelens, & Frank, 2007;

Lytle, 2009; McKinnon, Reedy, Morrissette, Lytle, & Yaroch, 2009). The original report found that overall the NEMS-S totals predicted that higher availability and quality in grocery stores related to higher income neighborhoods ($p<0.01$); and, price scores of unhealthy food items, in particular, were higher (more affordable) in convenience stores and in lower income areas ($p<0.01$) (Glanz, Sallis, Saelens, & Frank, 2007, p. 286-287). Results suggest that NEMS-S can inform new approaches to measuring reliable field observations in local stores and can be applied to test comparisons between store availability, quality, and price across various communities for valid food environmental assessments (Glanz, Sallis, Saelens, & Frank, 2007).

In the Global North, supermarkets positively improve food environments and prevent the emergence of food deserts because they provide healthy food options (Cummins, Smith, et al., 2009; Freedman & Bell, 2009; Glanz, Sallis, Saelens, & Frank, 2007). Fresh produce, in particular, are more affordable and available in supermarkets than in the smaller, more local stores (Farley, Rice, et al., 2009; Glanz, Sallis, Saelens, & Frank, 2007; Winkler, Turrell, et al., 2006; Zenk, Schulz, et al., 2005). Urban residents who live near and shop at a supermarket reduce their risk for health issues because they have the opportunity to access healthier and more affordable food than residents who live farther away (Inagami, Cohen, Finch, & Asch, 2006; Macintyre, Macdonald, & Ellaway, 2008; Winkler et al., 2006; Wrigley, Warm, et al., 2002).

Studies in the US and UK hypothesize that development of supermarkets in the city landscape was a result of the historical context in which city neighborhoods developed in those two countries (Sallis, Nadar, Rupp, Atkins, & Wilson, 1986; Wang, Cubbin, Ahn, & Winkleby, 2007; Wang, Gonzalez, Ritchie, & Winkleby, 2006; Wrigley, 2002). Policies that pre-date the civil and equal rights movements in these countries, particularly in the US, led to the development of segregated neighborhoods (Macintyre, Macdonald, & Ellaway, 2008; Sallis, Nadar, Rupp, Atkins, & Wilson, 1986). Proximity to the center of the city was not as important as the incidence of poor access to city transportation and infrastructure in local neighborhoods with uneven and fragmented development policies (Burns & Inglis, 2007; Lopez-Zetina, et al., 2006; Macintyre, Macdonald, & Ellaway, 2008; Pendola & Gen, 2007; Townshend & Lake, 2009). Thus, the ways in which city planning and development construct food environments either promotes healthier nutrition or exacerbates existing nutritional inequalities (Wrigley, 2002).

In the Global South, however, cities lack a formal economic base and many residents live in informal shantytowns. The public sector itself is weak; so regulation of resources, food price, and trade networks are also weak. The poorest urban residents depend on more informal food sources; thus, instead of using supermarkets residents use street markets, farmers or other food producers, convenience stores or bodegas, and open air market vendors (Plattner, 1985; Pottier, 1999). Therefore, during periods of low cash flows, residents have established direct connections with food suppliers who are able to create store credit lines for food purchase (Plattner, 1985; Pothukuchi & Kaufman, 1999; Pottier, 1999). Thus, researchers found that the open air markets and other informal food sources influence regional food environments in positive ways.

In the Global South, residents experience rising food prices more acutely than in the Global North, in part, because food budgets tend to be a higher proportion of household costs (Drewnowski & Specter, 2004; Dufour, Staten, Reina, & Spurr, 1997). Thus, there tends to be a greater public demand for governments to control the prices of food staples (Saltmarsh, 2009). In 2008, the Global Food Crisis exposed how interconnected our food environments have become (D’Souza & Jolliffee, 2012; Holt-Giménez & Peabody, 2008; Saltmarsh, 2009; Shah, 2008). The World Bank reports that global food prices rose 83% over the last three years and continue to climb (Saltmarsh, 2009; Shah, 2008). They estimated that an additional 100 million people have been driven into hunger because of the rising food prices (Holt-Giménez & Peabody, 2008). The executive director of the World Hunger Program stated: “We’re seeing more people hungry and at greater numbers than before. There is food on the shelves but people are priced out of the market" (Shah, 2008, Section 2, Para 1).

With urban sprawl and uneven global development of the food delivery system and food costs, we can theorize that food deserts are in the

Global South. Consider the food environment wherein a city cannot produce all the food needed to sustain local residents within its physical boundaries (Pothukuchi & Kaufman, 1999; Toynbee, 1970). Even in cases where urban, small-scale agricultural production occurs and is sold locally (Dijkstra & Magori, 1992; Drakakis-Smith, 1995), the local food prices remain subject to global inflation and other fluctuations that tie local communities into global networks (Evers, 1994; Plattner, 1985; Pottier, 1999). It is this integration of local residents into the global market that increases a household's dependence on accumulating cash for food (Drewnowski & Specter, 2004; Dufour, Staten, Reina, & Spurr, 1997; Godoy et al., 2005; Reyes-García, et al., 2004). How this works in relation to the food environment is the focus of this dissertation research, using the case of Paraguay.

Paraguay is atypical in relation to other countries in Latin America (Bacallao & Rajpathak, 2001). Paraguay's integration into the global economy is relatively recent; thus, the nutritional transitions that followed global integration are in its initial stages (Santa Cruz, Cabrera, Barreto, Mayor, & Báez, 2005). In the late 1980, the dominant political party (Colorado Party) realized that Paraguay needed to reintegrate into the world economy to improve economic growth. Democratization was considered the only means to achieve integration (Mora, 1998). So, in 1989, the Colorado party organized the collapse of the authoritarian state. In 1991, such integration occurred with Argentina, Brazil, and Uruguay through their signing of the Treaty of Asunción which opened trade markets known as *Mercosur* (*Mercado Común del Sur*), including food trade (Manzetti, 1993; Olarreaga & Soloaga, 1998).

The health issues in Paraguay also differ from the other countries in Latin America and the Caribbean in several areas directly related to health and nutrition. Around 68% of the urban population in Paraguay are overweight or obese (Filozof, Gonzales, Sereday, Mazza, & Braguinsky, 2001). The prevalence of children who are overweight and obese in Paraguay increases with gains in socio-economic status of their families in more urban areas (Singh & Shaw, 2004). Diabetes has become the third leading cause of death for adult women, and the fifth for adult men (PAHO, 2007). Comparatively, these are high diabetic-related mortality rates when compared with other countries in the Global South (Bacallao & Rajpathak, 2001). In Paraguay's capital city Asunción, a few cross-sectional studies found that many of the participants were either hypertensive or diabetic, but most participants were unaware of their health status (Ayala, Pino, Furiasse, et al., 1995; Jiménez, Palacios, Cañete, et al., 2000). These studies seem to indicate both poor quality and low coverage of available health care in Paraguay (Santa Cruz, Cabrera, Barreto, Mayor, & Báez, 2005).

San Lorenzo, Paraguay is exactly the type of setting in which one would expect to see rapid, dramatic, and critical changes in local food environments (Dufour & Piperata, 2004). Prior to 1990, San Lorenzo produced food for the capital city, Asunción, through local farms and as a distribution point for those farms at a great distance. However, since 1990 and the *Mercosur* agreements, the need to grow food locally has decreased because of the increase in the transport and trade of food internationally (Olarreaga & Soloaga, 1998). With the increase of international food markets came the need for more workers and, thus, more jobs. Migration to San Lorenzo from rural areas increased as rural Paraguayans sought non-agricultural employment. During this time of growth in international trade, the areas of Asunción and San Lorenzo grew with a subsequent increase in urban construction, paved roads, electricity access, food, and trade. However, available city services were still very limited. Accordingly, in San Lorenzo, the local food environment crosses international borders through the exchange of food varieties from producers in Brazil and Argentina. With the import of food from these countries, the price of foods became subject to international fluctuations during global food crises.

The objective in this research identifies the possible existence of a food desert in the Global South, specifically in the city of San Lorenzo, Paraguay. If this food desert does exist, then the question is whether it functions in the same manner as scientists indicate food deserts function in the Global North. An additional objective seeks to determine if residents of San Lorenzo are encountering the impact of a food desert by examining if a tradeoff exists between economically priced foods versus healthier foods. If such a tradeoff exists, then a food desert is likely to function in the same manner as in the Global North. If not, then food deserts need to be completely rethought if we want to apply the concept in research or interventions in the Global South.

This research is also local in scale in that it examines a small neighborhood (a *barrio*) within San Lorenzo, Paraguay. Prior to presenting the results of the research, I outline major studies that help to frame the research and hypotheses that I used to test between the emic (subjective) and etic (objective) observations in the research process. Finally, I discuss the scholarship of this research in terms of how the local urban food environment in San Lorenzo impacts the diet of its residents.

Literature Review

Food deserts focus on context (e.g., environmental factors) and how the context in which people live shapes their health risks, especially in regard to nutritional issues such as the risk of malnutrition, obesity, cardiovascular disease, and diabetes (Bodor, Rice, Farley, Swalm, & Rose, 2010; Booth, Pinkston, & Carlos Poston, 2005; Macdonald, Ellaway, & Macintyre, 2009). The presence of a food store facilitates the purchase and consumption of healthy food groups only if healthy food varieties are available and affordable (Inagami, Cohen, Finch, & Asch, 2006; Zenk, Lachance, Schulz, et al., 2009). When residents live in a food desert, the available food varieties are mostly unhealthy (obesogenic), expensive, or completely missing from their residential neighborhoods. A mediating feature in the food desert occurs when residents have the means to travel outside of the food desert boundaries and into more nutrient-rich and affordable food environments (Inagami, Cohen, Brown, & Asch, 2009; Rundle, Neckerman, Freeman, Lovasi, Purciel, Quinn, et al., 2009).

In the 1990's, the 'food desert' metaphor captured the attention of the Parliament in Great Britain who commissioned The Cabinet Office's Social Exclusion Unit to assess the relationship between the food environment and health inequalities and deconstruct the term food desert (Wrigley, 2002). In 1990, the Team's report *Bringing Britain Together: A National Strategy for Neighbourhood Renewal* deconstructed the term food desert using ethnographic methods by identifying residents and their concerns and identifying shopping strategies in the local food environment. The report found that in the UK access to healthy foods worsened as neighborhoods became poorer in income. It was also found that residents most affected by food deserts are those living in local areas most limited in social and economic systems (Acheson, 1998; Wrigley, 2002). The conclusions drew even more attention to the increasingly marginalized position of the poorest neighborhoods in Britain.

A series of exploratory studies proceeded to investigate food access across cities in the UK (Cummins, 2003; Macintyre, Macdonald, & Ellaway, 2008; Wrigley, Warm, Argetts, & Whelan, 2002; Wrigley, Warm, & Margetts, 2003). In these studies, researchers examined supermarkets to find the cost and types of foods available. It was found that across

British cities, supermarkets sold inexpensive and varied foods, so profiles of supermarkets were developed according to cost, variety, and location (Cummins, 2003; Macintyre, Macdonald, & Ellaway, 2008). When combining the supermarket profiles with the neighborhood health profiles, it was discovered that residents nearest to a supermarket had fewer incidences of obesity and cardiovascular disease, while those in neighborhoods farthest away had higher incidences of obesity (Wrigley, Warm, Argetts, & Whelan, 2002: Wrigley, Warm, & Margetts, 2003). A second analysis suggested that when residents with the means to travel outside of the local food desert boundaries and into more nutrient rich and higher income food environments, their dietary behavior resulted in a healthier diet than those residents without the means to travel to obtain a more diverse diet (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Whelan, Wrigley, Warm & Cannings, 2002; Winkler, Turrell, & Patterson, 2006)

Studies looking at the geographic distribution of supermarkets again found that they develop in uneven geographic distribution. Some develop far outside of densely populated areas (Whelan, Wrigley, Warm, & Cannings, 2002; Wrigley, 2002); while others develop in city centers using large tracks of commercial land use areas (Macdonald, Cummins, & Macintyre, 2007; Macdonald, Ellaway, & Macintyre, 2009). However, the higher the income of the residents in a geographic shopping area, the more likely it was to have local supermarkets available (Wrigley, Warm, Margettes, & Whelan, 2002; Wrigley, 2002).

The Team's resulting recommendation to Parliament suggested the funding of a series of controlled natural experiments (Wrigley, 2002). Researchers suggested that exploratory studies be conducted in selected urban neighborhoods. First, city sites were chosen for the intervention. Second, a baseline of resident shopping behaviors was established. Third, the stores agreed to implement the proposed intervention. Stores improved their local food selection (with the support of the municipality and corporate store offices). To ensure residents were aware of their improved food access, a number of promotional campaigns ran in local communities. Then researchers again interviewed neighborhood residents to discover if dietary intakes and behaviors improved alongside increased food store access. The results of two such studies follow.

In 2005, Cummins, Petticrew, Higgins, Findlay, and Sparks conducted an evaluation from the provision of a new food hypermarket in a food desert to reveal that residents who switched their shopping to the new supermarket improved their mean fruit and vegetable intake. Also, researchers found improvements in individual self-reported health, meaning that residents felt better about shopping for food. Thus, the researchers concluded that switching to the new store provided a 'protective effect' against poor food access.

In 2007, Petticrew, Cummins, Sparks, and Findlay conducted a second follow up study in the neighborhood with the hypermarket and found that more residents had switched their shopping to the hypermarket. All residents significantly improved their fruit and vegetable consumption since the previous study a few years earlier. In conclusion, the collection of scholarly and applied research activities in the UK provided excellent case examples in how to identify, understand, and remedy the negative effects food deserts have on lower income residents.

Prior to the inclusion of food deserts in the report *Bringing Britain Together: A National Strategy for Neighbourhood Renewal*, there was an average of two studies per decade from 1960-1980 that focused on residential exclusion from healthy food stores and how that exclusion impacted the health of residents in those neighborhoods (see Beaulac, Kristjansson, & Cummins, 2009). After the inclusion of food deserts in the literature, there was a great spike in published case studies appearing in the professional literature. The published literature review found 12 more case examples were published in the 1990's; then 29 cases more were published since 2000 (Beaulac, Kristjansson, & Cummins, 2009). Based upon the criteria used by Beaulac, Kristjansson, and Cummins (2009) in their literature review, I identified 19 additional studies published in 2009 and 14 more in 2010.

The food desert literature appears to be divided into three main lines of inquiry (Ford & Dzewaltowski, 2008). First, the research concerns the identification of a deprived environment. Comparisons between stores are used to identify deprived food environments and any contextual inequalities within the environments that are identified (Cummins, Smith, et al., 2010; Farley, Rice, Bodor, Futrell, & Rice, 2010; Freedman, 2009; Macdonald, Ellaway, & Macintyre, 2009; Wrigley, Warm, & Margetts, 2003). These comparisons examine whether geographic differences in the access and availability of food result in disparities in the retail food environment (Cummins, Smith, et al., 2009; Ford & Dzewaltowski, 2008; Lopez-Zetina, Lee, & Friis, 2006; Moore, Roux, Nettleton, & Jacobs, 2008; Sharkey, Horel, Han, & Huber, 2009). Second, research in various environments addresses the residential perceptions of their ability to access available food and what barriers hinder their access. In conjunction, researchers seek the identification of what influences residential shopping habits, including any barriers they encounter when shopping, and what coping strategies they use (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Dibsdall, Lambert, Bobbin, & Fewer, 2003; Jilcott, Laraia, Evenson, & Ammerman, 2009; Joshu, Boehmer, Brownson, & Ewing, 2008; Kaufman & Karpati, 2007). Third, the issue of dietary intake and how the sites where people shop may reveal a connection between the environment and nutritional risk is addressed (Inagami, Cohen, Brown, & Asch, 2009; Michimi & Wimberly, 2010; Moore, Roux, Nettleton, & Jacobs, 2008; Wang, Cubbin, Ahn, & Winkleby, 2007; Zenk, Lachance, Mentz, Kannan, & Ridella, 2009; Zenk, Schultz, Hollis-Neely, et al., 2005). Each of these three lines of research will be discussed in the following sections.

Deprived Food Environments and Local Residence. The common definition of a *food desert* is a deprived area in the food environment where people lack access to reasonably priced, nutritious food (Cummins, Smith, et al., 2010; Gallagher, 2006; Wrigley, Warm, et al., 2003; Wrigley, Warm, et al., 2002). Deprived areas are almost always characterized by lower socioeconomic status (income, employment, and educational attainment) and lack of city services and infrastructure (Cummins, Smith, et al, 2010; Freedman, 2009; Macintyre, Macdonald, & Ellaway, 2008). Within food environments, supermarkets are considered to be the best source for local populations to secure nutrition (Cummins, Smith, et al., 2009; Freedman & Bell, 2009; Glanz, Sallis, et al., 2007). Food deserts often lack supermarkets and hence they contain stores that have very little fresh produce and healthy food items (Cummins, Smith, et al., 2010; Gallagher, 2006; Moore & Diez-Roux, 2006; Shaw, 2006; Whelan, Wrigley, Warm, & Cannings, 2002); or, if food deserts do contain healthy foods, the prices of these foods are not affordable for local residents (Beaulac, Kristjansson, & Cummins, 2009; Drewnowski, 2004; Inagami, Cohen, Finch, & Asch, 2006; Macintyre, Macdonald, & Ellaway, 2008; Rose & Richards, 2004). In order for researchers to identify a deprived food environment, i.e., a food desert, it is essential that they (1) identify the kinds of stores built in the environment (Morland, Wing, Diez-Roux, & Poole, 2002); (2) measure the nutritional value, availability, and affordability of food in the various types of stores (Moore & Diez-Roux, 2006; Morland, Diez-Roux, & Wing, 2006); and, (3) analyze the types of variation in the food environment where residents lack access to income and city transportation (Wrigley, Warm, et al., 2003).

When researchers examine food deserts, they typically consider two characteristics: (1) the socio-economic status (SES) of the population who live in the identified area (Dibsdall, Lambert, Bobbin, & Fewer, 2003; Dibsdall, Lambert, & Fewer, 2002; Hemphill, Raine, Spence, & Smoyer-Tomic, 2008; Inglis, Ball, & Crawford, 2008; Latham & Moffat, 2007; Rose & Richards, 2004; Zenk, Schulz, Hollis-Neely, et al., 2005) and (2) the specific environmental attributes of the area such as walkability, availability, affordability, and quality of local food stores (Apparicio, Cloutier, & Shearmur, 2007; Bertrand, Theirien, & Cloutier, 2008; Burns & Inglis, 2007; Inagami, Cohen, Brown, & Asch, 2009; Rundle, Neckerman, et al., 2009). Urban planners define a walkable distance as ½ mile (Gallagher, 2006); thus, a walking distance greater than ½ mile to a supermarket verifies that residents live in a food desert (Gallagher, 2006; Nicholls, 2001; Rundle, Neckerman, et al., 20099; Talen, 2003). This is particularly important when residents lack reliable access to transportation, either by personal vehicle or reliable bus transportation (Burns & Inglis, 2007; Lopez-Zetina, Lee, & Friis, 2006; Pendola & Gen, 2007; Townshend & Lake, 2009). The underlying premise of this characterization of a food desert refers to the earliest observation by the UK Low Income Project Team that a mediating feature of the food desert involves the ability to travel outside of your neighborhood or town to improve food access (Whelan, Wrigley, Warm, Cannings, 2002; Wrigley, Warm, Margetts, & Whelan, 2003).

Research in other parts of the Global North (Canada, Australia, and New Zealand) found that stores did not vary in their availability or affordability based upon standard risk factors such as SES; instead, they found that ‘remoteness’ from the city center excluded residents from stores with more food variety (Latham & Moffat, 2007; Simmons, et al., 2005; Wang, Williams, et al., 2010). Thus, rural residents were at greater risk for obesity than their urban counterparts because urban residents have better access to supermarkets overall (Latham & Moffat, 2007; Simmons, et al., 2005; Wang, Williams, et al., 2010). Owning a car improved the likelihood that residents with greater distance to travel to larger supermarkets are likely to consume healthier diets while those without the means to travel were more likely to consume less healthy diets (Apparicio, Cloutier, & Shearmur, 2007; Burns & Inglis, 2007; Wang, Williams, et al., 2010).

Studies in the US and UK found that lower socioeconomic status among neighborhoods independently associates with food deserts. Individuals living in lower income neighborhoods lack food environments within a walkable distance; whereas, individuals living in higher income neighborhoods live in closer proximity to food environments with food stores within walkable distances (Lopez-Zetina, Lee, & Friis, 2006;

Pendola & Gen, 2007; Rundle, Neckerman, et al., 2009). Residents who lack transportation in food deserts have increased exposure to poor quality foods because they are unable to travel to healthy stores or supermarkets (Apparicio, Cloutier, & Shearmur, 2007; Bertrand, Therien, & Cloutier, 2008). Lower income residents with the means to travel to a supermarket by a personal vehicle increase their consumption of fruits and vegetables (Michimi & Wimberly, 2010; Moore, Roux, Nettleton, & Jacobs, 2008; Zenk, Lachance, Mentz, Kannan, & Ridella, 2009); whereas, residents who lack transportation are at greater risk and are more likely to consume more fast food (Burns & Inglis, 2007; Michimi & Wimberly, 2010; Moore, Roux, Nettleton, & Jacobs, 2008; Zenk, Lachance, Mentz, Kannan, & Ridella, 2009).

In another US-based study, researchers examined the premise that changes in the food environment changed dietary consumption patterns over time (Wang, Cubbin, Ahn, & Wikleby, 2007). They identified food deserts in California cities and compared the types of food sources across them, including restaurants and fast food options. At different points of time, researchers marked changes in the environmental context and administered a food frequency survey to local residents. Over a 10 year period, doughnut shops, fast food restaurants, and convenience stores developed near lower income residents. Researchers found, across the cities, that due to the increased availability of fast and snack food, the consumption of sweets and salty snacks increased the local body mass index (a measure of adiposity) over time (Wang, Cubbin, Ahn, & Winkleby, 2007).

Ford and Dzewaltowski (2008) note that geography does not translate into deprivation unless municipal laws and regulations exist that promote retail food stores in populated (census) areas. Furthermore, residents may have access to other kinds of food sources, such as agricultural markets, that researchers fail to identify as a part of the food retail environment (Jilcott, Laraia, Evenson, & Ammerman, 2009). Thus, researchers should not focus solely on the geographic boundaries of local food deserts; instead, researchers need to integrate the design of landscapes and local (city) regulatory policies to illustrate the underlying structures that support the development of food retailers relative to residential neighborhoods in geographic areas (Ford & Dzewaltowski, 2008; Morland, Wing, Diez-Roux, & Poole, 2002).

Accessibility is almost always defined by the store's location to residential homes and the walkability to that store (Rundle, Neckerman, et al., 2009; Smith, et al., 2008); a walking distance from residential neighborhoods greater than ½ mile to a supermarket verifies that residents live in a food desert (Gallagher, 2006; Nicholls, 2001; Rundle, Neckerman, et al., 2009; Talen, 2003). In Montréal, for example, researchers utilized spatial analysis (GIS) of lower income and higher income neighborhoods to identify the spatial location of large supermarkets; they found that lower income residents had more distance to travel to healthy and affordable supermarkets (Apparicio, Cloutier, & Shearmur, 2007; Bertrand, Therien, & Cloutier, 2008). In an interview-based study in Melbourne, researchers found that owning a car allowed residents to travel outside the food desert and into better quality food environments with supermarkets (Burns & Inglis, 2007).

To determine if residents have access to quality food environments became another task for food desert researchers. Establishing the availability of healthy foods requires a comparison between store types and their inventories. Generally, researchers find that supermarkets positively improve food retailing environments and prevent the emergence of food deserts because they provide healthy and affordable food options (Cummins, Smith, et al., 2009; Freedman & Bell, 2009; Glanz, Sallis, et al., 2007). One US-based study measured the amount of space (measured in meters) dedicated to fruits and vegetables across various types of food retailing stores, including smaller stores, supermarkets, general and drug stores (Farley, Rice, et al., 2009). They found that supermarkets offer more varieties and space for healthier foods than any other store (Farley, Rice, et al., 2009).

Another study found that stores are all “stocked differently” (Freedman, 2009). The results reveal that in lower income neighborhoods, the stores closest to residents were smaller corner stores or non-chain grocery stores which stock more varieties of tobacco and alcohol products over varieties of milk, fresh fruits, or fresh vegetables

(Freedman, 2009). The results confirm the general observation that smaller stores provide less healthy options for residents while supermarkets provide more healthy and affordable options. Fresh produce, in particular, is more affordable and available in supermarkets than in the smaller, more local stores (Farley, Rice, et al., 2009; Glanz, Sallis, et al., 2007; Winkler, Turrell, et al., 2006; Zenk, Schulz, et al., 2005).

However, a limitation in the analysis of shelf space and stocked food varieties is that researchers neglected to include the price of foods. Studies of food stores must examine the cost of food as a component of the store inventory because the budgets lower income residents have limit their purchasing behavior (Dobson, Beardsworth, Keil, & Walker, 1994; Drewnowski, 2004). So, even if healthy food is available, residents may select to purchase cheaper, lower quality bulk food items over more expensive fresh and healthy foods because they can buy a larger quantity of food (Beaulac, Kristjansson, & Cummins, 2009; Drewnowski, 2004; Glanz, Sallis, Saelens, & Frank, 2007). Thus, to understand the ways in which stores provide available options for food, a store measure must include the varieties, their price, and quality (Glanz, Sallis, Saelens, & Frank, 2007).

A major criticism of the current literature is that researchers assume too much rational choice in the decision of individual residents when they select to shop at food stores (Bowyer, Caraher, Eilbert, & Carr-

Hill, 2009; Jilcott, Laraia, Evenson, & Ammerman, 2009; Kaufman & Karpati, 2007). Thus, they fail to include subjective categories (emic observations) that identify how residents perceive their access. The critique also identifies that the 'food desert' as a term is a metaphor relating the subjective feeling of isolation with the objective reality of social exclusion (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009). Therefore, some claim that research about residential exposure must also take into account individual perceptions and how they cope or manage their exposure to obesity risk (Shaw, 2006).

The perception focused studies range from telephone and mail-based surveys (Inglis, Ball, & Crawford, 2008; Joshu, Boehmer, Brownson, & Ewing, 2008) to face-to-face household and ethnographic interviews (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Jilcott, Laraia, Evenson, & Ammerman, 2009; Kaufman & Karpati, 2007). Analyses explain how people perceive and understand the structure and resources available in their local environments to overcome (or cope with) local environmental and economic barriers (Inglis, Ball, & Crawford, 2008; Jilcott, Laraia, Evenson, & Ammerman, 2009; Kaufman & Karpati, 2007). Research finds that a combination of formal and informal relationships in the food environment provides the capacity for most residents to cope (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Kaufman & Karpati, 2007).

Access to safe and reliable transportation through a neighbor, friend, or family member allows for residents to cope with barriers in city infrastructure (Burns & Inglis, 2007; Lopez-Zetina, Lee, & Friis, 2006; Pendola & Gen, 2007; Townshend & Lake, 2009). Access to credit and cultural capital help residents cope with the economic barriers associated with food deserts (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Kaufman & Karpati, 2007). Some studies find that many lower income residents select to shop at smaller corner stores over supermarkets because they have access to informal lines of store credit (Graham, Kaufman, Novoa, & Karpati, 2006; Kaufman & Karpati, 2007). Using store credit requires the establishment and maintenance of a social relationship with the store staff over many years of regular interactions (Kaufman & Karpati, 2007). These results suggest that households improve their dietary intake through creating informal relationships around local food access (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Graham, Kaufman, Novoa, & Karpati, 2006; Kaufman & Karpati, 2007).

However, studies also cite that the 'personal barriers' people create for themselves are based upon their subjective perceptions and exacerbate existing challenges (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Joshu, Boehmer, Brownson, & Ewing, 2008). For lower income food shoppers, interpretations of local perceptions revealed that people felt uncomfortable in supermarkets because shopping without a credit or debit card embarrassed them (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Dobson, Beardsworth, Keil, & Walker, 1994). Thus, the 'personal barriers' people hold for themselves cause them to access poorer quality stores or fast food restaurants over supermarkets, which increased obesity risk associated with residence in the food desert (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Dobson, Beardsworth, Keil, & Walker, 1994; Joshu, Boehmer, Brownson, & Ewing, 2008).

Connection of Food Access and Health. The third area of research examines whether individuals exposed to poor-quality retail-food environments are more likely to have diets that include foods of low nutritional quality and high caloric density, and whether there are higher rates of obesity as compared to individuals exposed to high-quality food environments (Ford & Dzewaltowski, 2008). This research attempts to establish a link between diet and shopping behavior due to the kinds of exposure residents have in their environments; thus, it is based on results from the food desert research and the resident perception of access and possible barriers along with their coping strategies. Linking the quality of local stores with their residential clientele and subsequent dietary outcomes reveals how decisions become embodied and who is most at risk.

An intervention with small Latino-Hispanic populations revealed how increasing the interactions between smaller store retailers and their clientele can improve dietary intake of fruits and vegetables. In North Carolina, Latino-owned neighborhood stores play an important social and economic role for new immigrant households because they can help acculturate new immigrants and allow for residents to buy on store credit (Ayala, 2009). Households shop at the smaller stores an average of eight times per month, and they represent 33 percent of a family's total kitchen pantry and 84 percent of a family's total produce purchases (the remaining purchases were made at supermarkets). The stores devoted at least 50 percent of the shelf space to food products, including fruits and vegetables, ready-to-eat foods, and meat, but stocked far less low-fat dairy (and at higher relative prices) and more sugar-sweetened beverages and sweet and savory snacks, compared to non-Latino stores.

An intervention was then developed to promote the sales and consumptions of fruits and vegetables to shoppers in a random selection of stores. A number of food marketing campaigns were completed that included changing store displays and signs, increasing radio commercials, and training store personnel to become produce specialists. After the marketing campaign, Ayala (2009) surveyed households a second time and completed a comparison between the households who shopped at a store with the commercial campaigns versus those who shopped at a store without the campaigns. Analysis found that consumer fruit and vegetable intake increased by about one additional serving per day for those who shopped at the stores with commercial campaigns; and, through word-of-mouth, a number of newer immigrant shoppers switched to the stores with increased fruits and vegetable campaigns.

Methodological Approaches Used. A review of the methodological approaches employed to measure the food environment finds an array of tools used to examine variation between food stores

(McKinnon, Reedy, Morrissette, Lytle, & Yaroch, 2009). The review found that most researchers either employ a checklist survey tool based upon observation (Giskes, Van Lenthe, Brug, Mackenbach, & Turrell, 2007; Glanz, Sallis, Saelens, & Frank, 2007; Horowitz, Colson, Hebert, & Lancaster, 2004) or a face-to-face interview conducted by a trained field assistant (Dibsdall, Lambert, Bobbin, & Fewer, 2003). The most common tools to use with food stores were checklists; however, very few researchers provide the reliability and validity of their instruments (McKinnon, Reedy, Morrissette, Lytle, & Yaroch, 2009).

A tool found to be both reliable and valid in food environment research is the Nutrition Environment Measures Survey in Stores (NEMS-S) by Glanz, Sallis, Saelens, & Frank (2007). The developers of the NEMS-S observed that little progress in scales to measure quality of food environments existed, and those that did failed to report reliability and validity scores; therefore, the NEMS-S fills this gap (Glanz, Sallis, Saelens, & Frank, 2007). NEMS-S developed from an iterative process involving field work, research team deliberation, and expert consultation. Lytle (2009) contends that food environments need evaluation by standard tools that allow a rank ordering of an environmental attribute, such as food store quality; and, the NEMS-S complies with this assessment. Thus, stores that rank lower on the NEMS-S, and cluster in neighborhoods, frame a food desert area.

In the Atlanta metropolitan area, the NEMS-S study included four neighborhoods characterized by their census tract and further selected by food environment indicators (high versus low walkability and high versus low income). Each neighborhood had a minimum of 15 food stores classified as either grocery stores or convenience stores (specialty stores, such as bakeries and butcheries, were excluded because of the limited range of products). Ten food categories were observed including: fruit, vegetables, milk, ground beef, hot dogs, frozen dinners, baked goods, beverages, whole grain bread, and baked chips. Researchers based their selection of food items for each category on the federal and industry data of the top ten most consumed foods in the US.

The NEMS-S scores a composite measure for each store using the availability, quality and price for each food item classified under the food category measure (see Appendix A). The availability scores assign two points per indicator for the availability of healthier options and an extra point for more varieties. Price scores assigned two points for a lower priced healthier option and -1 point for a higher priced healthier option, and up to three points were assigned for having more produce of acceptable quality.

For example, if the store has milk, the store gets two points. If the store has low-fat milk, the store gets another point. If the store prices low-fat milk lower than regular milk, the store gets two points; but if the store prices regular milk higher than low-fat milk, the store loses a point.

Because the scoring system assigns two points per indicator for a lower priced health options, the magnitude of difference accounts for healthier food items at lower price and provides support for construct validity to rank stores (Glanz, Sallis, Saelens, & Frank, 2007; Lytle, 2009; McKinnon, Reedy, Morrissette, Lytle, & Yaroch, 2009). NEMS-S, however, is a relatively recent invention methodologically and very few researchers have employed the tool (Andreyeva, Blumenthal, Schwartz, Long, & Brownell, 2008; Gittelsohn, et al., 2007).

For example, two recent studies use NEMS-S and modify the instrument to fit the local field site. One study in Baltimore city, for example, used a simplified version of NEMS-S that lists 20 healthy food items only (e.g., presence of low-sugar cereal, low-fat milk, fresh fruits and vegetables). In this adaptation, researchers lose the ability to document prices between healthy versus unhealthy food items, but they maintain the measure for "healthy" quality food stores (Gittelsohn, et al., 2007). The results find that lower income neighborhoods lacked healthy milk products and that no store carried more than three varieties of fruits and vegetables on their checklist (Gittelsohn, et al., 2007, p. 40); thus, the retail stores in lower income, Baltimore neighborhoods are overall poor quality, and interventions directed at the corner stores to help and assist their food availability are necessary to improve local access.

In the second study conducted in New Haven, Connecticut, researchers redefined the food items to reflect the most common local food brands and varieties across various types of food stores; and, they created a three category measure for produce "freshness" (Andreyeva, Blumenthal, Schwartz, Long, & Brownell, 2008). Researchers found that the availability of healthy food items was significantly better in grocery and supermarket stores versus convenience stores (Andreyeva, Blumenthal, Schwartz, Long, & Brownell, 2008). However, the produce quality available to lower income neighborhoods was significantly lower than in the higher income neighborhoods ($p<0.05$); and, fruit in particular was much lower in quality in lower income neighborhoods ($p<0.01$) (Andreyeva, Blumenthal, Schwartz, Long, & Brownell, 2008, p. 1385). However, in neither study do researchers report the reliability and validity of their modifications.

In summary, in the Global North much of the research cites that the low cost of energy dense foods (Booth, Pinkston, & Carlos Poston, 2005; Drewnowski, 2004), the high palatability of sweets and fats associated with higher energy intakes (Drewnowski & Spector, 2004), and the association of lower incomes leads to lower intakes of fruits and vegetables (Anderson & Hunt, 1993; Freedman & Bell, 2009; Turrell, Hewitt, Patterson, Oldenburg, & Gould, 2002). Access to reliable transportation (either from sharing a ride or owning a vehicle) improves dietary consumption of fruits and vegetables and allows residents to leave the food desert in search of healthier food (Burns & Inglis, 2007; Lopez-Zetina, Lee, & Friis, 2006; Pendola & Gen, 2007; Townshend & Lake, 2009).

Access to informal credit lines and increasing personal relationships with local stores improves the consumption of healthy food for the lowest income residents (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Kaufman & Karpati, 2007). Finally, the presence of supermarkets suppresses the association between individual obesity incidence and the environment (Cummins, Smith, Taylor, Dawson, Marshall, Sparks, & Anderson, 2009; Freedman & Bell, 2009; Glanz, Sallis, Saelens, & Frank, 2007; Ingami, Cohen, Brown, & Asch, 2009).

Research Hypotheses

In reviewing the literature on food deserts, two weaknesses were identified. First, the research in food deserts, and more broadly in poor quality food environments, addresses only countries in the Global North. Second, the published case studies remain divided across various lines of inquiry and lack cohesiveness in methodological approaches and theoretical questions (Lytle, 2009).

In this dissertation, I propose to address these issues by examining three main lines of inquiry that exist in the identification and understanding of food deserts and their relationship to health risks in lower income residential areas. The first line of inquiry develops the comparison between various stores in the food environment and allows for the discovery of deprived food environments (e.g., food deserts) and contextual factors for health risks (e.g., lower income, walkable neighborhoods, and poor dietary intake). This line of inquiry combines the results from the research related to (a) geographic differences in the access and availability of food result along with disparities in the retail food environment and (b) neighborhoods of low socioeconomic status with high concentrations of racial/ethnic minorities that have limited accessibility to, and availability of, healthy foods (Ford & Dzewaltowski, 2008).

The second line of inquiry explores how local residential perceptions and informal relationships tied to their ability to access available food stores in the food desert translate into individual shopping and coping strategies. The small selection of studies focused on local food perceptions implies that social relationships do in fact reduce the negative effects of the physical environment (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Kaufman & Karpati, 2007). By integrating this line of inquiry into the analysis of food deserts and residential interactions, the primary criticism that a bias exists in the current literature towards rational choice is subdued. In other words, if residents find ways to cope or improve their access to food, then the influence of the physical environment declines and the influence of personal choice and social relationships increase (Lytle, 2009).

The third line of inquiry addresses how the location and inventory of local food stores that residents select translates into dietary consumption patterns and nutritional status (e.g., incidence of health risks). This line of inquiry examines whether individuals exposed to poor-quality retail food environments are more likely to have diets that include foods of low nutritional quality and high caloric density, and higher rates of obesity (Ford & Dzewaltowski, 2008).

A research design that addresses these three main lines of food desert inquiry requires that residents be linked to their food store and those stores be rank ordered in comparison to each other (Glanz, Sallis, Saelens, & Frank, 2007; Lytle, 2009). Examining how stores compare and contrast in the food environment reveals how restrictive an environment is with regard to food choice (i.e., the availability and accessibility of healthy, inexpensive options) for local residents (Lytle, 2009). Additionally, a measure of nutritional status and/or dietary intake as an outcome of the interactions must be utilized. Without a connection to real residential behavior, we will never understand the true state of risk in food deserts (Lytle, 2009), whether food deserts exist in the Global South, and, if so, whether food deserts are the same or different in the Global South as those identified in the Global North.

Table 1.1

Inquiry Line 1 Hypotheses: Food Environments in the Proposed Food Desert

1.a The smaller, convenient stores will lack fresh food at an affordable price.
1.b The supermarkets will be the best source of affordable quality food over other food stores in the environment.

To answer the hypotheses in Table 1.1, I employ a modified version of NEMS-S (adapted to reflect the common food items in a Paraguayan diet) to rank order stores and compare measures between the types of stores. I select a purposive sample of all food stores in the neighborhood food desert and the city center (supermarket) food district. The results of this line of inquiry are expanded and discussed in full in Chapter 3.

Table 1.2

Inquiry Line 2 Hypotheses: Residential Perceptions of Access and Subsequent Coping Strategies

2.a Residents will identify poor access to transportation as a key factor in their decision to shop at a store.
2.b Residents will identify access to store credit as a key factor in their decision to shop at a store, and the lowest income residents will utilize store credit services when shopping for food.
2.c Personal barriers will emerge from interpretation of household shopping strategies

The hypotheses in Table 1.2 are addressed through ethnographic, semi-structured interviews. In these interviews I ask the primary household food decision maker a series of questions about food access and their perceptions. I created transcripts from those interviews and loaded them into text analysis software (MAXQDA) to code on key terms and identify common themes relating to household shopping decisions. The results from this line of inquiry are expanded in Chapter 4.

Table 1.3

Inquiry Line 3 Hypotheses: Interaction of Food Desert and Residential Access/Strategies with Health Concerns

3.a Households with lower incomes are more likely to consume fewer varieties of fruits and vegetables
3.b Households with access to personal vehicles are likely to have increased dietary variety, particularly are likely to consume more varieties of fruits and vegetables
3.c Households that shop at supermarkets are likely to consume more fruits and vegetables and have a lower BMI overall

To address the hypotheses in Table 1.3, it is essential that I identify the primary food preparer or food decision maker who is the key household agent in a food desert (Dufour, Staten, Reina, & Spurr, 1997; Jilcott, Laraia, Evenson, & Ammerman, 2009; Kaufman & Karpati, 2007). Thus, I recruit the household food decision maker as a proxy for the overall household health outcomes. I employ a food frequency questionnaire and anthropometric assessments to measure dietary intake and nutritional status. I conducted all the statistical analyses in SPSS v.20. The results of these hypotheses are discussed in Chapter 5.

Structure of the Document

The document is divided into 6 chapters. Chapter 1 is an overview of the research and presents the hypotheses for the study. In Chapter 2, the methods and procedures used to collect data for this dissertation are described in detail. Chapters 3, 4, and 5 parallel the three main divisions in the current food desert literature and are linked to the corresponding hypotheses. In Chapter 3, I address the identification of food deserts in the Global South and describe a food desert in San Lorenzo, Paraguay. Chapter 3 addresses my hypotheses 1.a and 1.b. In Chapter 4, I review the issue of access to food in a food desert and the coping strategies and rationales people employ due to how they perceive their food access. Thus, Chapter 4 provides the results for hypotheses 2.a, 2.b, and 2.c. In Chapter 5, I address the interaction of food deserts with coping strategies and the nutritional risks that form from shopping behaviors in the food desert. Chapter 5 addresses hypotheses 3.a, 3.b, and 3.c. Chapter 6 is a discussion and final analysis of my study findings and related the findings to the field of Global Health. Then, I conclude with future research directions in the investigation of food deserts.

Chapter 2

METHODS AND PROCEDURES

The purpose of this chapter is to provide a description of the approaches that I used to frame my research and collect data for this dissertation. An examination of human culture, human environments, and their subsequent interactions that shape health risk outcomes benefits from anthropological perspectives and approaches. A hallmark of anthropological research is ethnography: a qualitative research method aimed to explore the cultural phenomena that reflect the knowledge and system of meanings guiding the daily life of a cultural group (Malinowski, 1922). Ethnography describes the nature of those who are studied through writing. An interpretation of the meaning between words spoken and written about members in a cultural group reveals shared understandings and common ideas. Explaining a decision-making framework around cultural knowledge, perceptions, and ideas leads to the articulation of the cultural factors needed to understand local health disparities and risk outcomes (Dressler 2005).

To do this, a biocultural framework is useful to examine how residents, as one part of the food environment interact with the other parts of the food environment (stores, salespeople, food varieties, traffic, and other shoppers). In addition, biocultural anthropologists consider how the cultural environment shapes the individual and community's well-being (Leatherman, 1996; McElroy, 1990). A biocultural framework defines the following concepts: culture is understood as “coping,” an adaptive process where human responses are negotiated to meet the goals and needs of the overall household given the environmental context; and, well-being is considered the health and security of humans (Dressler, 2005; Leatherman, 2005). In this dissertation, I define “well-being” as the nutritional status and dietary health of local residents.

To characterize the urban food retail environment, we must (1) identify the kinds of stores built in the environment (Morland, Wing, Diez-Roux, & Poole, 2002); (2) measure the nutritional value, availability, and affordability of food in various types of stores in which people access (Moore & Diez-Roux, 2006; Morland, Diez-Roux, & Wing, 2006); and, (3) analyze the types of variation in the food environment as a possible contributor to population obesity rates (Wrigley, Warm, et al., 2003). To measure the nutritional value and availability of food stuffs in a food environment, researchers need a tool to assess the kinds of food, its price and quality sold between various types of food stores.

The Nutritional Environment Measurement Survey for Stores (NEMS-S) reports high face and construct validity (Glanz, Sallis, et al., 2007; McKinnon, Reedy, et al., 2009); thus, it allows for researchers to assess all three requirements listed above. The NEMS-S calculates a composite “food environment quality” score from three sub-scales: availability, affordability, and quality (see Glanz, Sallis, et al., 2007). To analyze the variation in the food environment as a contributor to population obesity rates and other diet-related health, research requires a comparative analysis between the NEMS-S measures for each store.

Research Design

A research design that will address the three main lines of food desert inquiry requires that residents be linked to their food store and those stores be rank ordered in comparison to each other (Glanz, Sallis, Saelens, & Frank, 2007; Lytle, 2009). An examination of how stores compare and contrast in the food environment should reveal how restrictive an environment may be in regard to food choice (i.e., the availability and accessibility of healthy, inexpensive options) for local residents (Lytle, 2009). Additionally, a measure of nutritional status and/or dietary intake must be included to connect residential behaviors with the food environment. Without a connection to real residential behavior, it is not possible to understand the true state of risk in food deserts (Lytle, 2009) and whether a food desert exists in places such as San Lorenzo, Paraguay.

The research design is a two-phase, cross-sectional observational case study and the design mirrors the scholarly work by the UK Low Income Group and Social Exclusion Unit (Beaumont, Lang, Leather, & Mucklow, 1995; Wrigley, 2002). First, researchers explored the stores in the urban city and their surrounding neighborhoods to identify areas that had the poorest access to food retailing sources (supermarkets, convenience stores, drug stores, bakeries, butcheries, etc.) (Macdonald, Ellaway, & Macintyre, 2009; Wrigley, Warm, & Margetts, 2003). Second, they surveyed the store inventories and neighborhood characteristics (SES, obesity prevalence, transportation access, and distance from stores) (Macdonald, Ellaway, & Macintyre, 2009; Macintyre, 1996; Wrigley, Warm, & Margetts, 2003). Then, they compared their observations to identify the areas with the poorest quality environments as also low income (e.g., food desert) (Macdonald, Ellaway, & Macintyre, 2009; Macintyre, 1996; Wrigley, Warm, & Margetts, 2003). A final test came when they surveyed local residents about their perceived access to food stores and healthy foods (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Dibsdall, Lambert, & Fewer, 2002; Macintyre, Macdonald, & Ellaway, 2008; Whelan, Wrigley, Warm, & Cannings, 2002); and, they assessed local diets and nutritional status (Macintyre, Macdonald, & Ellaway, 2008). The results of the final test verified that residents in food deserts lack access to the materials they need to shop for food (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Whelan, Wrigley, Warm, & Cannings, 2002), and as a result consume less healthy diets and are at greater risk for obesity related health issues (Macintyre, Macdonald, & Ellaway, 2008). They related this lack in access to deprivation in which the lack in access ties to the policies that promote or deny the development of healthy stores near residential neighborhoods (Cummins, Smith, Aitken, Dawson, Marshall, Sparks, & Anderson, 2010; Macdonald, Ellaway, & Macintyre, 2009; Whelan, Wrigley, Warm, & Cannings, 2002; Wrigley, 2002).

The difference between my design and the UK research design relates to scale and resources. In the UK, the research was conducted by a collaborative team with systematic tools administered across research sites (e.g., various cities and neighborhoods) (Cummins, 2003; Macdonald, Ellaway, & Macintyre, 2009; Wrigley, 2002; Wrigley, Warm, & Margetts, 2003). Thus, personnel alone enabled the collection of cross-site comparisons and large population sizes. Additionally, the access to reliable secondary data sources allowed for the validation of field observations with municipal and city policies (Cummins & Macintyre, 2009). Finally, the commissioned funding from Parliament provided monetary support to utilize the best instruments required to collect and process data, including follow-up and intervention studies to retest hypotheses (Cummins, Petticrew, Higgins, Findlay, & Sparks, 2005; Petticrew, Cummins, Sparks, & Findlay, 2007; Wrigley, 2002; Wrigley, Warm, & Margetts, 2003). In San Lorenzo, however, I worked alone with some minimal support to hire and train local field assistance; I lacked reliable and recent secondary data; thus, I relied on inter-rater reliability tests and the adoption of standardized instruments for valid data collection. Furthermore, my funding sources were significantly smaller which is reflected in my smaller sample size and my selection of a one-time, cross-sectional, observational study design. Therefore, I focused on one neighborhood, in which I applied field observations and systematic survey collection in the food retail environment and in local residential neighborhoods. I maintained the exploratory and explanatory phases in my research, but the scale was much smaller and highly localized.

In Phase I, the exploratory phase, I identified a possible food desert and collected data to test the hypotheses that I derived from the food desert literature. Additionally, I explored the food retail environment in the downtown district and observed food preparation and shopping behaviors of local residents in San Lorenzo, Paraguay. In Phase II, the explanatory phase, based on survey and interview data, I utilized my observations from Phase I to adapt instruments used in Phase II. The instruments provided data to explain the availability, accessibility, affordability, and quality of foods in local stores. I interviewed a sample of residents to determine the local perceptions and strategies that households employ to select between food stores and subsequent nutritional outcomes.

The setting for this research study was the city of San Lorenzo, Paraguay, which is the third largest city in Paraguay with an estimated population of 200,000. San Lorenzo was chosen because it is an urban dormitory for the capital city of Asunción. The annual growth rate for San Lorenzo is about 4.7%, which is double the national growth rate of about 2% (PAHO, 2007). Historically, the residents in San Lorenzo grew food for retail in the open air markets. Since 1990, however, urban sprawl has forced the municipality to convert much of its agricultural producing land into residential and commercial property. To date, there are 52 residential neighborhood districts in the city; those districts that fall along the main bus routes serve the rural communities and the capital city and are the most densely populated. The neighborhoods that sit on the periphery of the city are less populated. Large tracks of vacant land on the periphery still produce some agricultural products for sale in the markets, but it is small in scale because most farmers must also work in the city to make ends meet. It is rare to find any subsistence farming in the city; almost all of the farming is mono-cropping for lettuce, bananas, or sugar. For many, the low cost of land provides incentives for rural residents to migrate into San Lorenzo and to look for new kinds of work (other than agriculture) and educational opportunities. Even with this massive migration and development, paved roads, electricity, and other city services are still very limited.

Two major food retail districts exist in the San Lorenzo municipality. One is in the residential areas, while the other is the downtown commercial district. Downtown, the bus line runs through San Lorenzo and stretches about one mile long. At the end points of this bus route are various supermarket chains and highways that radiate from those end points either into central Asunción or into rural areas. In the residential areas, many corner stores and convenience stores comprise the types of food stores residents can access by walking. Thus, this is the type of area in which we are more likely to find neighborhoods existing in a food desert.

The complete study timeline spanned a 14-month period from 2009-2010 (see Table 2.1). Phase I (the exploratory phase) began in September 2009 and ended in January 2010 with a month break in December 2009. The break in the timeline was essential in order to incorporate findings into the survey protocols that I used in the Phase II data collection (the explanatory phase). Phase II began in January 2010 and ended in November 2010.

Table 2.1

Data Collection Time Table

Starting Month, Year	Ending Month, Year	Data Collection Task
September, 2009	November, 2009	Exploratory Data Collection
December, 2009	January, 2010	Household Protocol Development
January, 2010	March, 2010	Field Training & Neighborhood Mapping
March, 2010	April, 2010	Household Protocol Pilot & Refinement
April, 2010	July, 2010	Part 1: Household Data Collection
July, 2010	August, 2010	Food Retail Environment Data Collection
August, 2010	November, 2010	Part 2: Household Data Collection

The format of the data collection necessitates a long study timeline. In some countries, city-wide data (e.g., environmental, population census and food retailing data) is available; however, in the case of Paraguay, the most recent census and city data dates to 1992. In addition, very little ethnographic information exists on mainstream, Paraguayan diet and food customs. Therefore, extended time was needed to meet with families, learn about their local meals, and improve language skills before I conducted household interviews. The local dialect includes a mix of Spanish and *Guaraní* words. I kept a vocabulary list of *Guaraní* key words and phrases, and met with a language tutor during all fieldwork months. Throughout my fieldwork, I kept a field note journal of the observations and summarized those notes each month into a summary report document.

I spent my first three months (September 2009 to November 2009) talking with market vendors and distributors and shopping for food every day. The market officially opens at 4 a.m. and closes down around 6-7 p.m. The slowest hours, with fewer shoppers, are during the earliest morning hours (4-7 a.m.). I acted as a participant "shopper," and never bought my groceries at one store or one stall. Instead, I spread my shopping throughout the downtown district. The only store in which I shopped on a daily basis was the *despensa* (small corner store) closest to my apartment, as is the custom. By December 2009, I had introduced myself to every vendor, grocery store manager, and butcher in the downtown district.

Additionally, I spent time meeting with various families in different neighborhoods. I had planned to "freelist" common meals and food varieties with local residents, but I did not elicit enough information; so I asked residents to describe common recipes. That way, I was able to receive more information about meal composition and common food varieties. Then, I selected five families to teach me how to prepare meals and take me food shopping on their trips. The families were selected by a convenience sample; I lived with one family that sold household durables downtown, and selected the other four based upon their occupations in the city: two were food stall vendors, one was a restaurant owner, and the final was a taxi driver.

During observations, I identified those corner stores and convenience stores that are often hidden from plain view. For this reason, I incorporated participatory mapping strategies with residents in the final protocol. I sampled about half of my residential population before collecting food stores surveys, and then I was able to identify most of the "hidden" food stores in the neighborhood. From April 2010 through July 2010, I kept a master map of all the shops mentioned to me by residents.

In December 2009, I incorporated my observations into the original NEMS-S to modify the survey instrument for Paraguay and into the household protocols. In January 2010, I began to map the food environment and household neighborhood field site. I used the months of February and March 2010 to select and train field assistants for household data collection; and, in March 2010, I piloted my household protocol with local residents in a neighboring *barrio*. In April 2010, I began administering the household protocol with recruitment ongoing throughout data collection. In July 2010, Arizona State University students joined me in Paraguay for a study abroad and field internship program to learn and assist in the NEMS-S modification, pilot, and data collection. In August 2010, I returned to household interviews. All data collection ended in November 2010. The details of procedures and methods are discussed below in the following sections.

Data Collection: Phase I – Exploration

The identification of a food desert requires a map to determine the boundaries of the neighborhood, or *barrio*. The map is necessary for the researcher to navigate the area and to build the sample framework. However, finding a map of San Lorenzo proved difficult. First, I went to the city municipal building, but they informed me that they didn't have any maps. Then, I went to the post office to ask if they had a map with the city postal codes and they did not. I asked about the postal codes and the post office employees seemed uncertain as to where the postal codes fell on a map. They explained that mail is delivered to the main postal office in downtown; recipient phone numbers are listed next to the postal codes; and, residents are called into the post office to pick up their mail. Bills are delivered directly to households by the companies and not by the postal service. As a result, I began asking residents where they lived and learned that neighborhoods were named for their *capilla* (small church or chapel that serves the city Cathedral).

While talking with residents, they informed me that I should speak with the taxi drivers as they are the most knowledgeable about city street design and neighborhood boundaries. Following this advice, I eventually met one driver who gave me a map of the city with the boundaries of each neighborhood clearly marked and named for its *capilla* (see Appendix C). Thus, I chose to use the residential district map as opposed to zip codes in identifying the barrios in San Lorenzo. Together, with this map of the city, the taxi driver and I conducted a windshield survey to select a barrio as a possible food desert. Also, I obtained GPS coordinates of each store and household; given the closeness of the market stalls, the coordinates were pooled, and all GPS coordinates will be used in later analyses.

Neighborhood Selection

Windshield Neighborhood Survey. There are 52 named neighborhoods in San Lorenzo. With a local key informant (taxi driver), I drove through all the neighborhoods located outside of walking distance (more than ½ mile) from the downtown food retailing district (including supermarkets and the open air market). This windshield survey helped me to identify which neighborhood had the poorest access to bus transportation, evidence of low-income housing (tin roofs, dirt floors, and wooden wall materials), and the fewest number of stores in the neighborhood boundaries.

Field Site Mapping. I used the residential district map, given to me by the taxi driver, to prepare two hand-drawn maps of the city and neighborhood food environment. In January 2010, I mapped the selected neighborhood site, named in this dissertation as *Rio Barrio.* The *Rio Barrio* map included a number of variables: food stores, houses, and vacant land (see Appendix C). I scanned the map provided to me by the taxi driver into my computer for a digital copy. Then, I enlarged the *Rio Barrio* from the city map. Then, I printed a hard copy of the *Rio Barrio.* Next, I traced over that map to create one blank map. Next, I worked with San Lorenzo college students who assisted me in mapping the variables.

To ensure the reliability of the overlay map, I assigned blocks of space to the students and myself; and, we rotated through these blocks of space on the same day at different times drawing our observations onto blank map copies. After drawing the maps, I checked for variation and errors. I selected the two maps with 100% match. I divided both the market and neighborhood into sections and assigned the sections to myself and the assistant who had the best match. After all the sections were mapped, I pieced all the segments together to create one final map.

On a second map I included the market stalls and their type of food products. In July 2010, three students from Arizona State University and I mapped all the stalls in the food retail environment and stratified the sample by the types of food varieties sold at the stall, including fruits and vegetables, local herbs, grains, dairy, and meat. Again, sections of the market were assigned and we mapped those until we had a perfect match. Then, we walked down each side of the street and mapped the stalls by their food varieties. Later, I merged the individual maps to create one main food market map.

Sampling and Recruitment Strategies

Target Sample Size and Strategy: Food Stores. The research design and hypotheses require that I provide a representative sample of all food stores in the food environment to identify a food desert. Given the small number of supermarkets downtown and in the neighborhood, I employed a purposive sample strategy of every food store in the neighborhood site and downtown district. In addition, I linked every household's food store decision to their food store rankings (of which there are three predictors: availability rank, accessibility rank, and quality rank).

Open Air Market Sampling Strategy. The open air market, however, was too large to sample every stall (approximately 200 stalls). For a valid representation of the market stalls, I stratified the stalls by their food varieties to identify the proportion of food stall types that comprise the total market. The total number of stalls in the market is around 200; however, there appeared to be very little variation in price between the stalls, particularly for produce items which dominated the total market stall count. Therefore, I selected a target sample size of at least 10% of all the stalls, specifically 24 total (CI=18.8%, CL=95%). I allowed for a larger sampling error (CI>10) because of the small margin of price variation between the produce stalls.

Time and Schedule of Food Store Surveys (NEMS-S). The original NEMS-S developers recommend that data collection begin in stores after the food bins and shelves have been recently stocked. Therefore, I met with each general manager, store owner, or market stall attendant and asked for his or her permission to administer the NEMS-S tool and to do so immediately after the shelves have been stocked. Based upon the vender's and store manager's feedback, I proposed a day and time when I would like to come with field assistants to collect NEMS-S data. I assured them I was not associated with the popular media but with an academic institution, and I allowed them to review the survey. Most store managers needed to call their supervisors (or owners) to get permission to allow me to collect data. Then, I returned on a scheduled date to confirm participation. All store managers and vendors asked for a morning time, except for one store that asked for an evening time. The times selected were during their low business hours so not to disrupt local shoppers and after recent replenishing of food items.

I did not provide any incentive for store owners or managers to participate in my study. Prior to recruitment, I spent three months establishing relationships with the market vendors and store managers. Because of the long relationship building in early fieldwork months, I believe that when asked food retailers to participate, there were no issues, that is, few refusals.

Target Sample Size and Strategy: Households. In order to have a reliable and valid sample of the households, a target sample size of 74 will achieve alpha of 0.05, power between .90 and .95, f^2: 0.15, actual power: 0.9510, in a one-tailed t-test for fixed model regression with up to 3 predictors, based on a power analysis. However, given that I will count the total number of households in the neighborhood, I will adjust the target sample size using the finite population correction formula (Cochran, 1977): $n' = (n_0) / (1 + (n_0 - 1)/N)$, where $n_0 = 74$, $N=732$, $n'=67$. With this adjustment a target sample size of 107 individuals will achieve alpha of 0.05, power between .90 and .95, f^2: 0.15, actual power: 0.9509, in a linear fixed model regression with up to 3 predictors. Thus, I planned to include a target number of 67 households and 110 individuals in the study.

Household Sampling Strategy. I randomly selected 133 households using a probability proportionate to size (PPS) sampling strategy. Researchers recommend PPS when populations are unevenly distributed, and the sample intends to represent the population (Bernard, 1988; Handwerker, 1993; Miller, Wilder, et al., 1997). On a copy of the final neighborhood map, I placed 100 dots around the edge randomly drawing lines between them. The point of intercept for each line will be the closest food source to the neighborhood residents with the most food item variety available. I applied a random number as a sampling interval along the lines on the map to create a household recruitment list.

I considered a *household* as all the people who regularly "share the pot" at mealtime and a *residence* as a set of behaviors that explains what people actually do in the place where they live (Netting, 1993; Netting, Wilk, & Arnould, 1984). I recruited both the head of the household (the person who makes the economic decisions for the family) and the primary, household food decision maker (the person who makes decisions about what to buy and cook for the family). If the potential participant did not consent, I thanked them for their time and left. If they did consent, I scheduled a date and time to return and conduct interviews. I also requested that the time I returned for data collection be during the day when most other household members were home because I wanted to administer a food frequency questionnaire and anthropometric procedures to every household member. At the time of the scheduled interview, I used a purposive sample measure to recruit all members.

Since the household selection was random, but the sample within the household was purposive, it was necessary to build rapport throughout the community neighborhood. To build rapport in San Lorenzo, I shared in a customary pastime: drinking *tereré*. *Tereré* is a loose-leaf tea (e.g. *yerba mate*) served in a *guampa*, or a gourd. Ice cold water is poured into the *guampa* over the tea leaves and a metal straw, or *bombilla,* strains the liquid from the leaves when drunk. Paraguayans drink *Tereré* in the mid-morning and mid-afternoon. While we mapped the neighborhood, my field assistants and I carried our own *guampa*, *bombilla*, and jug of iced water. When we met residents during the day, we offered to share our *tereré* with them. By the time we finished mapping the neighborhood many residents knew our names. The practice of sharing *tereré* with residents continued throughout data collection.

Time and Schedule of Household Interviews. The household interviews were held early morning, mid-morning, or mid-afternoon. I did not conduct any surveys at night or after dark for safety reasons. Fewer buses ran at night, particularly to the neighborhood as evening approached. All interviews were conducted on Monday through Saturday. During the pilot, many residents asked that I not interview on Sundays because residents either attended church or visited with their extended family, either in another area of the city or in the rural communities. And, for those residents working during the week, Sundays are their days to rest. On Saturday, however, most residents preferred to schedule interviews in the morning only and stated that Saturday afternoon and evening were the only times during the week that the entire family is together. I planned to schedule 2 interviews a day, Monday-Friday, and one interview on Saturday; although some days were spent recruiting families for the next week. I interviewed from 3-10 households per week.

I randomly selected 133 households using a probability proportionate to size (PPS) sampling strategy, and 69 agreed to participate. Of the total 133 households that I contacted, 22 houses were abandoned; 16 households declined participation because they worked late (interview times were only during daylight hours for safety); 6 household food preparers and shoppers didn't show up for their interview; 11 households declined because they didn't want to participate; 10 houses did not have an answer at the door (I knocked at least 3 times before moving on); and, 69 agreed to participate. The household response rate is 80%; I excluded abandoned houses, houses with no answer at the door, and houses who agreed to participate but were unable to schedule during our field hours.

I found two cases where two housing structures were headed by one food decision maker. That is, two different locations had the same food shopper and preparer, but different household heads. As I define a household as those who regularly share the pot at mealtime; the family with two houses did share the pot at mealtime. I asked the household members if they ate together and discovered that every day they share food and meals in one house location. In both cases, the households had separate household heads and separate income earnings; however, they shared one primary food decision maker and one secondary food decision maker (who is the spouse of the household head). I conducted the interviews with both participants and their transcripts are shared; but, I kept the rosters separate. Therefore, I report 68 households and household food decision makers in the sample, but I have 66 interview transcripts.

Sample Limitations. I encountered two major limitations in data collection. One limitation of the study is that I did not use the Nutrition Environment Measures Survey for Restaurants (NEMS-R) (Saelens, Glanz, Sallis, & Frank, 2007), or a similar assessment tool to evaluate the availability, accessibility, and quality of prepared foods at local restaurants. I lacked the resources to conduct micro and macro nutrient content of entrée and prepared meals. Instead, I excluded restaurants as a source of food in the food environment and only focused on retailing stores. I did note the restaurants in my observations for future research.

An additional limitation involves the possibility of “missing” participants in my individual “household members” sample. Within the *Rio Barrio* all residents were not present. This results in a skewing of the demographic data in terms of gender, age, and occupation status. Some residents are “missing” from my sample because they leave the neighborhood each day to earn money downtown in San Lorenzo or Asunción. Some residents may work closer to the neighborhood and are able to come home for lunch during their work-day break; however, most residents purchase meals in restaurants or cafeterias downtown or near their workplace. Research finds that significant dietary differences exist for populations that work part to full time than for populations that spend more time in residence (French, 2005; Lassen, Hansen, & Trolle, 2007;

Pratt, Lemon, Fernandez, Goetzel, Beresford, French, et al., 2007; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008).

I excluded these "missing" individuals from my sample for two reasons. First, it was almost impossible to schedule a time with those participants when I could safely come into the neighborhood. Most of the employed population work Monday through Saturday and return home after 9 p.m.; and I planned to conduct all interviews before 6 p.m. Second, I planned to focus my study on nutritional risk for those who stay at the house most all days, which are primarily women and children. And, I assume that people who spend more time with the food decision maker are more likely to adopt their dietary and nutritional health behaviors over time (Netting, 1993; Netting, Wilk, & Arnould, 1984). A number of case studies that focused on household food production share this assumption as a valid proxy for the overall health of the household (Dufour, Staten, Reina, & Spurr, 1997; Jilcott, Laraia, Evenson, & Ammerman, 2009; Kaufman & Karpati, 2007).

Data Collection: Phase II – Explanation of Food Stores

I answer the first set of hypotheses (see Table 2.2) using the exploratory phase of this research (e.g., windshield survey and field site mapping) and the observations made using NEMS-S (adapted to reflect the common food items in a Paraguayan diet). I used a purposive sample of all food stores in the neighborhood food desert and the city center (supermarket) food district and in the *Rio Barrio*. I used a stratified random sample of all the food stalls in the open air market.

Table 2.2

Inquiry Line 1 Hypotheses: Food Environments in the Proposed Food Desert

1.a The smaller, convenient stores will lack fresh food at an affordable price.
1.b The supermarkets will be the best source of affordable quality food over other food stores in the environment.

Interview Instrument: Nutrition Environment Measures Survey for Stores (NEMS-S)

Using the original NEMS-S design and framework, I adapted the survey assessment tool for San Lorenzo food environment. First, the original developers of the NEMS-S took a representative sample of the stores in neighborhoods selected by food desert indicators (low walkability and low income), which was established by the windshield survey. The city and neighborhood district have a small food store sample size; therefore, I took a purposive sample of every store in the neighborhood and downtown food district. In the open air market, however, I took a stratified random sample of the food stalls by the food groups. At each stall, I administered the full survey. I expected that some stalls would have a variety of food measures while others would have less. Therefore, I used the mode of all the survey measures to create one, aggregated final score for the open air market. I chose to use the mode because the mode is the attribute of the variable that occurs most often.

The original NEMS-S based their food items on the most commonly consumed foods in the US. In the adaptation, I changed the food items to reflect the most commonly used food items consumed in San Lorenzo and sold in food stores. Some food items are the same as the original, while others must be changed due to their availability and cultural setting. The items must have a healthy option. Bread, for example, is a common food item; however, the bread in San Lorenzo is white bread and I was unable to find a store with a healthier variety. So, instead of bread I selected two kinds of flour for everyday cooking: white flour is the regular item and corn flour is the healthier option.

For the meat measure, most Paraguayans prefer *carnaza* (beef steak) over ground beef. Therefore, the Paraguayan NEMS-S includes both lean and regular varieties of ground beef and *carnaza*. For the dairy measure, I counted regular and low-fat milk and yogurt. Rather than using soda for a beverage measure, I selected brand varieties of *yerba mate,* an infused tea beverage that is consumed daily. I added the most common mate brands purchased and the most common low-calorie, diet brand. The produce measure reflected local dietary preferences and the items shared across most stores. The produce included: apples, bananas, oranges, mandarins, limes, tomatoes, onions, bell peppers, carrots, and manioc. For the produce list, I found that each store usually had two varieties per food item. One was priced lower than the other variety. So, I selected to observe the low price and high price for each produce food item. The lower priced varieties were usually Paraguayan; whereas, the higher priced varieties were usually imports. The final food list reflects the most basic food varieties Paraguayans consume on a weekly basis.

Finally, the developers of NEMS-S worked with local experts, students, and academics to create the NEMS-S measures. I also worked with local experts and academic students to develop the Paraguay NEMS-S. I conducted the adaptation in July 2010 during a weeklong, in-field workshop with students from Arizona State University. I designed the field internship to teach these students how to modify the NEMS-S. The program dates were set to run during July 2010 to coincide with the summer break at Arizona State University and to fit within my study timeline. As a pre-requisite to my field internship program, each student needed to complete the "Train the Trainer Program" at Arizona State University (the training program was designed by the developers of the original NEMS-S at Emory University). After the workshop, I assigned stores to each student (including myself) and we adapted NEMS-S and collected NEMS-S data over 15 days. The following will detail the steps we will take in the modification process during the workshop.

Food Retail Environment Field Internship. First, I gave the assistants a tour of the food retail environment to acclimate them to the different types of stores and their designs. The supermarket store designs mirrored those in the US, of which the students were accustomed; however, the smaller stores stock their shelves very differently. Large, floor coolers that open with a lid rather than in a glass door is where the milk and yogurt were stored. Both products are sold in liter size bags, not jugs. At first, students found it difficult to find some of the foods on the list until they had spent more time looking around the stores and shopping for their own personal needs.

During the tour, I pointed out the key produce items listed on the survey. We made some quick judgments about the quality or “freshness” to find out whether the students felt competent in judging quality since the size, shape, and color of the food may be different from that in the US. For this reason, we purchased some food that they believed looked “good” versus “bad,” including some food items that might go either way. Then, we opened and tasted them. Bananas, for example, are much smaller than in the US and less yellow. They may have some bruising; however, after we peeled and tasted them, the students found that the peel is much thicker so the bruises don’t show up on the banana itself.

Manioc posed a number of problems for the US students because they have no experience eating or cooking the food. Therefore, I arranged for a local resident to give a mini-lecture on how to identify “fresh” manioc. Again, we purchased a few kinds of manioc and cooked the manioc for the students to taste. Afterwards, they were able to identify “good” manioc. The key to distinguishing the quality of manioc requires looking at the part of the tuber that has been cut, where the white tuber is exposed. If you can see the fibers that run through the tuber, it is poorer quality.

For a full week, we piloted the NEMS-S survey and conducted inter-rater reliability tests. The NEMS-S requires that we must achieve 100% agreement across all food item categories and between coders. Cohen's kappa is a robust measure of inter-rater reliability for qualitative (categorical) items. We adapted survey categories until we were able to achieve an acceptable kappa measure (>60%). In the final week, and after we reached acceptable kappa measures, we divided up sections of the food environment and assessed and scored all food stores and stalls. See Appendix A for sample surveys, summary scores sheets, and point scoring table.

Data Collection: Phase II – Explanation of Households

Table 2.3

Inquiry Line 2 Hypotheses: Residential Perceptions of Access and Subsequent Coping Strategies

2.a Residents will identify poor access to transportation as a key factor in their decision to shop at a store.
2.b Residents will identify access to store credit as a key factor in their decision to shop at a store, and the lowest income residents will utilize store credit services when shopping for food.
2.c Personal barriers will emerge from interpretation of household shopping strategies

During Phase II the explanatory phase for households requires connecting the NEMS-S observations and ranks with household food production decisions. I randomly sampled for the households in *Rio Barrio*. I addressed hypotheses 2 (see Table 2.3) through interpretation of content codes in ethnographic, semi-structured household interviews. In these interviews, I asked the primary household food decision maker a series of questions about food access and their perceptions. I created transcripts from these interviews and loaded them into text analysis software (MAXQDA) to code for key terms and identify common themes relating to household food production and shopping decisions.

Table 2.4

Inquiry Line 3 Hypotheses: Interaction of Food Desert and Residential Access/Strategies with Health Concerns

3.a Households with lower incomes are more likely to consume fewer varieties of fruits and vegetables
3.b Households with access to personal vehicles are likely to have increased dietary variety, particularly are likely to consume more varieties of fruits and vegetables
3.c Households that shop at supermarkets are likely to consume more fruits and vegetables and have a lower BMI overall

To address Hypotheses 3 (see Table 2.4), it was essential that I identify the health status of the primary food preparer or food decision maker who is the key household agent in a food desert (Dufour, Staten, Reina, & Spurr, 1997; Jilcott, Laraia, Evenson, & Ammerman, 2009;

Kaufman & Karpati, 2007). Thus, I recruited the household food decision maker as a proxy for the overall household health outcomes. I employed a food frequency questionnaire and completed anthropometric assessments to measure dietary intake and nutritional status. I conducted all the statistical analyses in SPSS v.20.

In addition, I pooled all household members across the sample into one population of individuals. The rationale I used seeks to test the "common" diet among residents in San Lorenzo. In addition, I examined the variations between demographics in the population to identify how nutritional status and dietary intake vary between groups. No specific hypotheses are tested in this analysis because the goal seeks to identify the "common" diet and to verify the observations from the exploratory phase with five families and the explanations derived by household food decision maker in the ethnographic interviews.

Household Interview Protocol

I identified each household member in the protocol and what roles people share in the household, particularly around food production. I used the information gathered from the primary food preparer or decision maker as a proxy for the household. I isolated the food decision maker from other household members and interviewed them with a household roster and a semi-structured interview.

I employed two methods to assess well-being and dietary health: a food frequency questionnaire and anthropometric assessments. I assessed every household member in the sample to compare across the sample. The food frequency questionnaire enabled me to evaluate dietary intake over a month period. Anthropometric procedures allowed me to evaluate nutritional status.

Household Roster. I employed a standard household roster to identify all the household members that "share the pot" at mealtime. This form provides for collection of demographics: age, gender, place of birth, level of educational attainment, occupation status, and relationship to household head. Also, I asked who makes the primary decisions for household food production (i.e., household food decision maker), and I noted which household members assisted the household food decision maker in food preparation and shopping. These characteristics were coded for 0=never, 1=always, and 2=sometimes. Finally, I asked how long the family has lived in San Lorenzo and in their present residence, and what motivated them to move into their residence. Because a large proportion of employed participants are "missing" from the sample, I will drop occupation as a categorical and descriptive variable from analysis.

In the pilot, I found that the best way to identify issues relating to city infrastructure involved asking residents to list the advantages and disadvantages associated with living in San Lorenzo. These two questions were developed into short-answer, open ended questions. Later, I coded the answers for categories in the list and ran saliency tests on the results to identify key factors relating to city infrastructure.

Ethnographic Interview. A semi-structured, ethnographic interview allows for the identification of household functions (Spradley, 1979). I asked three questions in this order (1) What is your daily routine; (2) Where do you go to shop for food; and, (3) In your opinion, what is a 'balanced meal,' that is a meal with nutrition and healthy for you and your family? During the pilot interviews, I found very little variation in the first question that asked about daily routines; however, I also found that participants relaxed after answering this question. Therefore, I kept the question as a part of the protocol because it was the best lead into the interview. For prompts, I asked, 'What do you do next' or 'Then what?'

The second question, 'Where do you shop for food?' is the most important question in the interview. As a follow-up, I asked 'Why do you shop there?' As a second follow-up, I asked, 'If you are lacking something, like milk or bread, where else do you shop?' As a final prompt, I asked 'What kinds of transportation do you use when they shop?' In all follow-up prompts, participants provided a lot of information about the stores, their availability and affordability. In the pilot, I found that participants could talk about their stores for up to thirty minutes; and, most rationales reflected comparisons between other types of stores.

My primary prompt to keep participants talking throughout the interview was the silent probe, where I will say nothing and wait for the participants to explain their statement. In the pilot, I found this probe was most effective because residents thought I didn't understand them, so they would explain in greater detail their position or perceptions about stores. After their explanation, most participants would ask me if I understood; and, I would say yes. If I wanted to follow up with something they had said, I would repeat their prior statement and ask them to explain more. If I didn't want to follow up, I would move on to the next question.

The final question about a 'balanced meal' was the most difficult for participants to answer. In the pilot, I found that most participants didn't understand the question, so I added 'a meal with nutrition and healthy for you and your family.' This helped residents understand what I meant by a balanced meal, and participants often explained their meal composition and their weekly dietary plans. I kept the question difficult for participants because I wanted to assess the variation between families who have a concept of nutrition in their meal planning from a biomedical point of view versus those participants who do not. Additionally, the answers I collected from this question may help to tailor nutritional interventions in the future.

Food Frequency Questionnaire. Dietary variety demonstrates how greater dietary diversity correlates with improved health status (Hodgson, Hsu-Hage, & Wahlqvist, 1994; Ruel, 2003). I employed a food frequency questionnaire (FFQ) to obtain a score of dietary variety (McCrory, Fuss, McCallum, Yao, Vinken, Hays, & Roberts, 1999; Ruel, 2003). A FFQ has high reproducibility and validity (Willett, Sampson, Stampfer, Rosner, Bain, Witschi, et al., 1985). A FFQ characterizes the common dietary intake of individuals and allows for multiple-day assessments of actual foods consumed; whereas, other dietary measurement tools require multiple assessments over more than one day which was impractical given I planned to meet with households and individuals only once. This dietary survey of common foods and their dietary classifications allowed for a quick assessment of the variation in local diets without adding burden onto households that participate in the study.

In the questionnaire, I included many of the food items measured in NEMS-S, as well as other items (food and meals) common to the Paraguayan Diet. I categorize the food items by six standard food groups to create a measure of dietary diversity scale for each individual (McCrory, Fuss, McCallum, Yao, Vinken, Hays, & Roberts, 1999). Table 2.5 lists the number of food and types of foods for each food group category. I calculated dietary variety for each food group as the percentage of different food types consumed within each food group, regardless of the frequency with which they were consumed. If the food was consumed during the month, I counted it and then, took the average; a score of 0=low variety and 1=all varieties. See Appendix E for a listing of food types and their description, including the syntax that will be used to create the food item variables into food groups.

Table 2.5

Food Group Descriptions

Food Group	Number of Food Types	Represented Food Type
Condiments	7	Sugar, Sweetener, Mayonnaise, Honey, Butter or Oil, Salt, Ketchup
Dairy	1	Yogurt
Energy-containing Beverages	5	Cocido, Soda, Juice, Milk, Tereré, Mate
Fruit and Vegetables	8	Fruit (various), Fruit Salad or Cocktail, Onions, Lettuce Salad, Green Pepper, Tomatoes, Vegetables (various), Squash
Lunch and Dinner Entrees	13	Arroz or Fideo, Asado, Beef, Sausage, Croquette or Empanada, Hamburger, Hot Dogs, Eggs, Milanesa, Pizza, Chicken, Poroto, Vori Vori
Sweets, Snacks, and Carbohydrates	12	Rice, Rice or Potato Salad, Manioc, Peanuts/Popcorn/Crackers, Bread, Potatoes, Sopa Paraguaya, Cake, Tortillas, French Fries, Pudding, Chipitas or Cookies

For frequency of consumption, I asked each participant if they had consumed the food item listed in the last month, and if so, how often (once a month; 2-3 times a month; 1-2 times a week; 3-4 times a week; 5-6 times a week; or, everyday). Post-data collection, I collapsed these categories into four major time periods (never, monthly, weekly, and daily) for ease of descriptive explanation: 1-3 times a month=monthly; 1-4 times a week=weekly; 5-7 times a week=daily. I did not collect data on portion sizes, so my analysis of consumption frequency is more descriptive of intake than nutritionally caloric.

Anthropometry. Using a SECA portable stadiometer measuring in meters and a digital scale measuring kilograms, I measured the height and weight of every participant to create a measure for body-mass-index (BMI). The formula for BMI equals weight mass (kg) divided by height (m) squared (e.g. $BMI=kg/m^2$). I used standard anthropometric procedures, outlined by Frisancho (1990), to measure individuals, and I classified BMI-defined underweight, normal weight, overweight, or obese for all study participants with reference to the revised WHO international percentiles (de Onis, Onyango, Borghi, Siyam, Nishida, & Siekmann, 2007). The WHO recommends lowering the cut-off points for all BMI categories and changing the age classifications by one year (see Table 2.6); they find no difference between male and females, and recommend standard points for adults (ages 19 and older); but, they do find differences between male and female children (ages 18 and younger).

Table 2.6

WHO BMI Categories by Reference Measures

BMI Category	Adults	Children	
		Male	Female
Thin to Normal Weight	<25	<16.6	<16.9
Overweight	25-29	16.6-18.2	16.9-18.7
Obese	>29	>18.2	>18.7

Data Management and Analysis

To clarify my data management and analysis procedure I have provided a chart for each hypothesis with the type of data I collected, the sites and individuals from which I collected the data, and the form of analysis that I used. Following the charts is a discussion of the various analytical functions I used to process data.

Data Collection: Phases I & II – Food Stores

Hypothesis 1: (a) The smaller, convenient stores will lack fresh food at an affordable price; (b) The supermarkets will be the best source of affordable quality food over other food stores in the food environment

Data Collection Type	Units of Analysis	Data Analysis
Windshield Neighborhood Survey	52 neighborhoods in San Lorenzo, Paraguay	Field Site Map preparation: Neighborhood Identification
NEM-S Interview	Supermarkets, *Despensas*, and Market Stalls	NEM-S scoring; ANOVA & Independent t-tests

Data Collection: Phase II – Households

Hypothesis 2: (a) Residents will identify poor access to transportation as a key factor in their decision to shop at a store; (b) Residents will identify access to store credit as a key factor in their decision to shop at a store, and the lowest income residents will utilize store credit services when shopping for food; (c) Personal barriers will emerge from the interpretation of household shopping strategies.

Data Collection Type	Units of Analysis	Data Analysis
Household Roster	Head of Household Food Decision Maker	Descriptive Statistics; ANOVA & Independent t-tests
Semi-Structured, Ethnographic Interview	Paragraphs of Transcribed Interview Text	Word Frequency & Saliency Tests; Content Analysis
Hand-drawn Maps	Downtown Food District & *Rio Barrio*	Store Location & Walkability

Hypothesis 3: (a) Households with lower incomes are more likely to consume less varieties of fruits and vegetables; (b) Households with access to a personal vehicle are likely to have increased dietary variety, particularly are likely to consume more varieties of fruits and vegetables; (c) Households that shop at supermarkets are likely to consume more fruits and vegetables and have a lower BMI overall.

Data Collection Type	Units of Analysis	Data Analysis
Food Frequency Questionnaire & NEMS-S Scores	Head of Household Food Decision Maker	Descriptive Statistics; ANOVA & Independent t-tests; Linear Regression Analysis
Individual Health assessments-Anthropometry & NEMS-S Scores	Head of Household Food Decision Maker	Descriptive Statistics; ANOVA & Independent t-tests; Linear Regression Analysis

General Population Health Assessments: No specific hypotheses will be conducted; instead the analysis will identify the "common" diet among residents across households and comparisons of health will depend on basic demographic variables (age, gender, household size, and level of educational attainment).

Data Collection Type	Units of Analysis	Data Analysis
Food Frequency Questionnaire & Household Roster	All Household Members	Descriptive Statistics; ANOVA & Independent t-tests
Individual Health assessments-Anthropometry & Household Roster	All Household Members	Descriptive Statistics; ANOVA & Independent t-tests

Interview Recording and Transcription. I recorded the ethnographic interviews with a digital recorder, transcribed them, and loaded the transcripts into MAXQDA, a software program for text analysis. I hired two local, professional transcribers to type the recorded interviews. Two were needed to check data quality and transcription of *Guaraní* text (which I was unable to do myself because I do not speak, read, or write *Guaraní*). Within days of the interviews, I gave the digital recording mp3 file to a professional transcriber. When the transcriptions were completed, I read through the text with the recorded interview and cleaned the text and spelling when necessary.

If *Guaraní* was used, I made a memo in the transcription for evaluation with the recorded interview. The transcriber who does not originally type the *Guaraní* was asked to type the text in the recordings where *Guaraní* was spoken. If major revisions needed to be made, I asked the original transcriber to re-do the transcription.

Before translation, I assigned my language assistant from the field to review her words transcribed to make sure her recall matched her interview. After she found no errors, other than spelling, we began translation and back-translation. Two native speakers conducted the translation and back-translation of the interviews; one typed up the transcriptions while the other collected the interviews with me. Both were familiar with the context of the study and the style and flow of the interview. This procedure is considered to be the most accurate way to deal with translation of colloquial speech in bilingual settings (Brislin, 1970; Werner & Campbell, 1970).

I entered all the data from surveys and questionnaires directly into an excel sheet while I was in the field. I checked the data regularly to verify that no mistakes were made. Then, when I returned to the US, I imported the excel sheets into SPSS. I created a series of data matrices to perform analytical tests. First, the household roster data was entered into one dataset for the household analysis. Second, individual line data from the rosters was entered into another dataset. I divided the individual line dataset into two sub-datasets: (1) study participants (with nutritional variables) and (2) “missing” participants (with household roster information only). The variables that match between all the databases will include household ID, age, gender, and education level. From the raw data, I created a series of variables in SPSS v.20.

Text Analysis. The semi-structured interviews allowed me to code within sections using MAXQDA text analysis software. In the text analysis, I explored the household interview data on food desert indicators (e.g., store types, price, accessibility, availability, food freshness or quality, store location, city transportation, and personal modes of transportation) based upon word frequency tests across all interview documents in MAXQDA. Next, I interpreted blocks of paragraph text surrounding any mention of a store or transportation; the coding on stores was automatically performed by MAXQDA auto code function.

I interpreted the variation on other household functions (daily household chores routines and meal composition and preparation) and reviewed all the answers given from the first question asking about daily routines and the third question asking about preparing balanced meals. I selected the best quotes from those answers to provide some description of the types of responses that I collected. However, the bulk of the analysis focused on stores and shopping strategies. So, I coded the stores where people shopped with the NEMS-S ID and selected that variable to be merged into the SPSS dataset with household demographics. Then, I replaced that code with the NEMS-S ranking score (and sub-scale rank scores) from the food environment dataset and into the household dataset.

The short answer questions that listed city advantages and disadvantages were selected out of the transcriptions and turned into a text file (.txt). I reviewed items and categorized them by themes. Then, I saved a clean file and imported the file into ANTHROPAC (Borgatti, 2002). In ANTHROPAC, I ran saliency tests on the list categories to reveal common positive and negative factors relating to city infrastructure.

NEMS-S Food Environment Variables Identification. The NEMS-S scores field observations using a composite scaling method. I created score sheets to allow for the aggregation of each measure into a scale (see Appendix A for sample sheets). If the store offers the food item on the scale, then the researcher will score a measure for availability. If the store offers a healthy (or fresh) food option, the researcher will score a measure for quality. If the healthier (or fresher) food option costs less than the unhealthy option, the researcher will score a measure for affordability. Any modification of NEMS-S must guarantee that the scoring rules remain intact while the food items may be changed to suit different populations (see Glanz, Sallis, et al., 2007). The original scale ranges from 0-38 points, and the scale that I used in this dissertation also ranges from 0-38. I entered the scales for the overall store score, food availability score, food affordability score, and the food quality score into SPSS. Finally, I standardized the values for each score to develop ordinal ranks: 0=lowest rank, 17=highest rank.

Other Variables Identification. From the household rosters and other survey questionnaires, I created a number of variables to characterize the individual and household samples. Given the possibility of a high proportion of "missing" cases from the individual samples, I ran Independent t-tests between the participants in the study and the "missing" cases on age, gender, and education to identify any bias in the sample before conducting analyses. I excluded children who are too young to participate (younger than 7 years old) from the comparisons (see Table 2.7).

Table 2.7

Description of Variables in Population Comparisons and Analyses

Level of Measurement	Variable Name	Description
Individual		
Nominal	Gender	Male or Female
Ordinal	Level of Educational Attainment	Highest level of educational attainment: Primary, Secondary, or Technical College and/or University
Interval-ratio	Age	Age of participant in years
	Dietary Variety	Degree of food variety consumption; subscale by food group
	Nutritional Status	Body-mass-index: under to normal weight, overweight, obese categories
Household		
Nominal	Vehicle Use	Type of vehicle use for the household
	Primary Food Store	Type of primary food store for the household: supermarket, municipal market, smaller grocers or convenience stores
Ordinal	Ranks of Primary Food Store	NEMS-S Ranks for the primary food store for the household: sub-ranks for availability, affordability, and quality
Interval-ratio	Years in Current Residence	Total number of years household resided in their current residence
	Income	Accumulation of all monthly incomes from each family members
	Size	Accumulation of all household members in participant's home
Other Variables Used to Categorize and Select Populations		
Nominal	Household Composition	Type of household based upon kinship structure with the household head
	Occupation Status	Type of occupation and employment status of participant
	Relationship to Household Head	Type of relationship participant has with the household head
	Food Decision Maker	Participant that makes the food shopping and meal preparation decisions for the family

Statistical Analyses. I ran statistical tests using SPSS v.20 software. I ran an analysis of variance (ANOVA) with a Bonferroni Post-hoc test and Independent T-tests to compare between different nominal and ordinal groupings on store types, dietary variety, and nutritional status. I used linear regression analyses for the individual samples and the household samples to predict obesity risk.

Chapter 3

A FOOD DESERT IN THE GLOBAL SOUTH?

SAN LORENZO, PARAGUAY

The food desert topic integrates the design of landscapes and local regulatory policies to illustrate the underlying structures that support the development of food retailers relative to residential neighborhoods (Morland, Wing, Diez-Roux, & Poole, 2002). A collection of contextual studies from the Global North finds that food deserts emerge in landscapes due to historical transitions associated with human settlement (Sallis, Nadar, Rupp, Atkins, & Wilson, 1986; Wang, Cubbin, Ahn, & Winkleby, 2007; Wang, Gonzalez, Ritchie, & Winkleby, 2006; Wrigley, 2002). In urban centers, neighborhood food deprivation ties to exclusionary practices by zoning and planning committees at political levels (Wrigley, 2002); however, in the Global South, municipalities and planning committees lack political power and local revenue needed to design non-exclusionary infrastructure and city services (Hall, 2005). Most people, in the Global South, rely on an informal economy for income, food, health care, and shelter (Freire, 2005; Hall, 2005). Thus, how food retailing environments develop in the Global South and whether or not these environments can also be identified as food deserts remains unclear in current scientific observations.

Findings in San Lorenzo, Paraguay

Food environments are the locations within the census areas where residents can access food in local stores. The *census areas* are determined in cities by the blocks, precincts, barrios, or physical structures that are used by its citizens to identify where they live, vote, or work. *Deprivation* is characterized by low income, poor housing, unemployment and low educational attainment, lack of transportation or walkability, and city services. In the study of food environments, public health researchers make comparisons among the inventories of the food stores to identify the supply of essential foods and the availability of food varieties for local residents. Researchers also ascertain the quality of the food and its nutritional worth. If food stores rank poorly overall, or are missing completely from the environment, then the food environment qualifies as a *food desert*. In the case study of San Lorenzo, Paraguay, I have two hypotheses listed in the following table.

Table 3.1

Hypotheses: Food Environments in the Proposed Food Desert

1.a The smaller, convenient stores will lack fresh food at an affordable price.
1.b The supermarkets will be the best source of affordable quality food over other food stores in the environment.

Windshield Survey Results

There are 52 barrios total in San Lorenzo. I chose to drive through all the neighborhoods located outside of a walking distance (more than ½ mile) from the downtown food retailing district (including supermarkets and the open air market). The windshield survey identified which neighborhood had the poorest access to bus transportation, evidence of low-income housing (tin roofs, dirt floors, and wooden wall materials), and the fewest number of food stores. Most of the neighborhoods had at least 3 food stores; the food items and price hardly varied between stores in different neighborhoods. For bus transportation, however, only one neighborhood had a single bus line enter through neighborhood; other neighborhoods had a minimum 3 bus lines. Additionally, this neighborhood had a higher incidence of densely, populated poor housing. I selected this neighborhood, referred to as *Rio Barrio* for additional food desert assessments.

Walkability and Bus Observations

Walking in the *Rio Barrio* can be difficult and unsafe, particularly for elderly or disabled populations. The roads vary from paved with cobble-stone to dirt roads to dirt pathways (see Figure 3.1). Sidewalks, if they exist at all, are mostly cracked and uneven, so it is easy to trip or lose your footing. Sometimes it is safer to walk in the road than to walk on the sidewalks. Dirt paths wash away when it rains. A person’s feet can sink in mud up to his or her ankles during the rainy seasons (May – August) making it difficult to trudge through the neighborhood to access a bus or local food store.

Figure 3.1. Photo of *Rio Barrio* roads; left: cobbled; middle: dirt; right: a road being paved.

Additionally, the streets flood, regardless if they are paved or dirt or located in the neighborhood versus downtown. All roadways lack a drainage system with the capacity to channel heavy water flows. The one bus that comes into the *Rio Barrio* will refuse to enter when it's raining out of fear that the roads are washed out or the bus might get stuck in the mud. During the rainy season, residents can go almost a week without getting into town to access food. A week can be a long time, especially when you shop 'day-to-day,' or shop to fill up the shelves in the smaller local stores. All observations indicate strong, contextual support for the existence of a food desert in San Lorenzo.

When roads are washed out, residents have difficulties accessing food environments. Residents farther from food sources may have an unsafe and hazardous walking route to access a food source. In a similar vein, the open air street vendors occupying the city sidewalks and their customers who walk alongside the food stalls are also at risk from street flooding and from the busses and cars that pass (see Figure 3.2).

Figure 3.2. Photo of residents walking with groceries in *Rio Barrio*; left: neighborhood; right: open air “street” market.

San Lorenzo Food Store Sample

There are 12 *despensas* (e.g., corner convenience stores) and 4 supermarkets in my store sample. The *despensas* comprise the food environment in which residents can access by walking. Some of these stores are located in plain view and built alongside paved roads; whereas, other stores are tucked into the corners of dirt foot paths or as enclosed porches on the sides of local houses (see Figure 3.3). *Rio Barrio* residents often access these smaller shops when they are unable to go downtown, due to their inability to pay for food or bus fare. It is within these smaller shops where residents can negotiate a credit line for their food purchases with store-owners.

Figure 3.3. Photos of *Rio Barrio despensa* store fronts; left and middle: despensas with a sign and main entrance; right: despensa built off the side of a house.

Inside the *despensas*, the stores vary in size and shelving space (see Figure 3.4). *Despensa* owners access the open air market to stock their shelves with food. Each morning store owners travel to the market, either on the bus or in a personal vehicle, and buy food varieties in bulk and by the kilo. They return by 8 a.m. to open their store and begin selling to local residents. All *despensas* close around noon for lunch, and the larger stores open again around 2 p.m. Of course, if a shopper comes by a smaller shop and knocks on the window, the smaller owners will sell a food product to the shopper. However, most shoppers access the smaller stores in the morning and rarely return after the *despensa* closes.

Figure 3.4. Photo of *Rio Barrio despensa* shelves and food bins; left: no fresh produce available; middle: some fresh produce available sold by the unit; right: more fresh produce available sold by the kilo.

Despensa owners pay the market price for food and the municipal government fees for the days they open their store. At the end of the month, owners then pay a tax to the government on the food they sold. Receipts are uncommon, but store owners will keep a ledger of their sales, including a ledger for customers who buy on store credit. Larger *despensas* will sell food products by kilo or by the dozen; whereas, smaller stores will sell by the unit or individual food product.

There are five major supermarkets downtown, but only four are included. The fifth store denied survey access unless I went to the corporate office and made a formal request. Since none of the other stores asked this question, and time did not allow for me to travel to corporate office, I chose not to include the fifth store. Inside the supermarket, shelves are stocked at three major points during the day. Most stores stock when they open, which is around 6 or 7 a.m.; then, they restock around noon; and later again around 6 p.m. They close between 9 p.m. and 10 p.m.

Downtown, supermarkets post their daily specials outside of the building structure. Managers explained that the billboard-type advertisements draw in customers that shop for *ofertas* or sale prices (see Figure 3.5). In the first months of field work, I observed that residents will either walk the downtown district scanning the posted prices for the best deal, or they will ride the bus along the route peering out the windows at the sales prices. Store managers, aware of this practice, state that they change the billboards and sign postings regularly to invite business.

Figure 3.5. Photos of major supermarket chain store; left: Photo of a supermarket and parking lot; right: Photo of ASU student in the milk aisle at a supermarket; in the smaller stores, one brand of milk versus in the supermarket where aisles and coolers shelve many brands of milk.

The open air market is a system of daily interactions between the formal and the informal economy. A union or *feria* exists between the distributors and vendors. The *feria* is a group of individuals who help to keep the market stalls organized and food supplies available. People pay the *feria* to rent a stall, and people pay a fee for a license from the city to sell food products. The license is a flat rate based upon days of work and not products or amounts sold. There are two major areas of the market:

the inside market and the outside (street) market (see Figure 3.6). Stalls are built in small squares and most vendors have one stall; however, vendors who have more time and generational heritage in the *feria* have acquired more stall space and sell more varieties of food products.

Figure 3.6. Photo of the open air market; left: the indoor part of the market; right: outdoor stalls lining the street.

The open air market vendors begin business around 4 a.m. when the first food delivery trucks arrive. All day long, vendors sift through their food pulling out the items that are too ripe or rotten. Vendors set the culls aside in crates under the stands or, for those outside, they throw the rotten food into the streets and do not attempt to sell them. In the later afternoon, more trucks arrive to deliver food products, and some vendors will restock if needed. The market closes around 6 p.m. Inside vendors use metal cases that fold up and lock; while outside vendors pull fencing around the products and lock with a dead bolt (see Figure 3.7).

Figure3.7. Photo of the open air market at closing time; left: inside market lock boxes; right: outside market locked in with fences.

Food Trucks and Food Delivery. Throughout the day, regional truck drivers deliver food to the open air market (see Figure 3.8). They make two major stops, one in San Lorenzo and one in Asunción in Mercado Cuatro (open air market for the capital city). Once the trucks are brought into the city, drivers meet with the vendors in the market and a few *despensa* owners in the city (though this varies among neighborhoods and is less common). Some trucks are contracted to stop at the smaller grocers along the route, but others drive between the city markets. Most frequently, drivers deliver imported produce from Brazil or Argentina. Meat, poultry, soy beans, sugar, bananas, and manioc are grown in Paraguay either on the urban fringes or from the rural areas, and they also are trucked to the food vendors.

Figure 3.8. Photo of agricultural producers delivering food to San Lorenzo Market.

Truck drivers establish relationships with the producers on the Argentina and Brazil borders to acquire produce and deliver the food to the market vendors. Once the food is brought into the city, designated delivery stops exist for the vendors to trade cash for food. These drop-off points also may include the informal side streets where men gather to sell food in baskets or on foot routes throughout the city. Vendors pay for the bulk food at market price and pay the city a daily fee to sell food products. In my field site, however, none of these vendors entered the neighborhood. They chose not to sell in the neighborhood because the *despensas* provide food to neighborhood residents.

Very rarely are vendors also producers; but, when they perform both roles, they take shifts selling in the city. Family members will bring in food from their farm and will sleep with friends or family with an apartment nearby. Those without family or friends may sleep on the streets near their food products. Then, in the morning, they awake and begin selling, continuing this practice until their business partners (usually relatives) arrive with new food products to sell. The people who have been selling the products then take the truck back home to the countryside and their partners stay in the city. It's very dangerous work for the poorest vendors who sleep on the streets.

During my participant observation at the open air market, food vendors and smaller store owners explained to me that the recent political and commercial campaign to develop more supermarkets in Paraguayan cities resulted in many of the local businesses and neighborhood grocers being replaced. As supermarkets increase in neighborhoods, the number of local businesses and food vendors decrease. In surrounding towns, for example, the open air markets have completely shut down due to their inability to compete with chain supermarket *ofertas* and sale prices. When the open air markets closed, many smaller grocers and corner stores closed because the open air market was the source of their store inventory. In the Asunción Metropolitan Area, San Lorenzo is one of the last remaining cities with a vibrant, large open air market.

Food Stall Sample in the Market. In the San Lorenzo market, I counted 200 food stalls and randomly sampled 26 stalls in total (CI=17.9%, CL=95%), which exceeds the required 24. Table 3.2 displays the stratification of the sample by food stalls. Of the 26 stalls, 3 stalls sold only fruit, 8 stalls sold only vegetables, and 6 stalls sold both vegetables and fruit. Of the vegetable stalls, 2 only sold lettuce, radishes, and other green leafy vegetables that I did not include in the survey. Of the fruit stalls, one sold only strawberries, which was not listed on my survey. I collapsed all the information on stalls that sold produce into one category (N=19). Other stalls included the sale of herbs for mate (N=3), grains (N=3), meat (N=2), and milk (N=1).

Table 3.2

Open Air Market Sample Statistics

Stall Indicator	N Total	% in the Total Market	Adjusted Sample Size*	Actual Sample Size (CL=95%)
Herbs	25	13%	3	3 (CI=52.4%)
Grains	11	6%	2	3 (CI=50.6%)
Dairy	11	6%	2	**1 (CI=98%)**
Produce	126	63%	15	19 (CI=20.8%)
Meats	27	14%	3	2 (CI=67.95%)

* The measure indicates the % of Stalls in the Total Market multiplied by the required sample size (24), and then rounded to the next number up.

Finding milk in the market was difficult because refrigerators used to keep milk fresh require electrical facilities that are unavailable to most market stalls. Thus, there is most likely a significant sampling error for the dairy measure. However, I am confident that the produce measures across stalls are an accurate representation of the open air market, which is most important since existing food desert analyses focus on availability of fresh fruits and vegetables over other food varieties (Cummins, Smith, Aitken, et al, 2010; McKinnon, Reedy, Morrissette, Lytle, & Yaroch, 2009).

NEMS-S Reliability

During the field internship, three Arizona State University students and I piloted the NEMS-S survey and conducted inter-rater reliability tests. We achieved 100% agreement across all food items and among all four coders. The kappa score, however, for produce freshness with 4 and later, 2 categories, was poor (below 0.5 with virtually no agreement). We discussed why we coded one food one way versus another and decided that a three-level, ordinal scale might be better than the 4 or 2 category scale. Then, we created the scale description to carry with us as we made our observations shown in Table 3.3. Our reliability scores improved with the three-level scale. The average kappa score in the first test was 0.578 (76% agreement) across all produce items. In our re-test, the kappa scores further improved (avg. kappa=0.790, 87% agreement). Our first quality kappa scores are similar to other reported kappa scores using NEMS-S, but our re-test kappa scores improved unlike those in other studies which did not always improve (see Glanz et al., 2007).

Table 3.3

Description of Produce Freshness Categories

Scale Value	Description
Unacceptable quality	bruised, cracked or broken surfaces, dark, dry, mold, mushy, old looking, overripe, signs of shriveling, sunken spots in irregular patches
Acceptable quality	good color, good condition, some spotting or marks acceptable
Excellent quality	clean, firm, fresh, great or perfect color

NEMS-S Descriptive Statistics

I provide the descriptive statistics for each NEMS-S measure of availability (see Table 3.4), food prices (see Table 3.5), and produce quality measures (see Table 3.6) by store types, including the assortment of food stalls in the market. The tables provide the average from the raw measures observed using the Paraguay NEMS-S. The number of stores or stalls (N) varies; this is due to the fact that some lacked available food items. For example, in Table 3.5, the count of convenience stores changes from 7 to 6 because one of the stores did not contain beef. Only seven of the total 12 *despensas* are listed because 5 others did not have the food categories observed by the NEMS-S, which is shown in 3.4 by the average (mean) availability score. NEMS-S summarizes the observations in the "score" sheets to enable standardization of the tool measures and then points are assigned based off of those summaries (see Appendix A for sample examples).

Table 3.4

Availability of Food Items between Store Types; values are shown as a percentage of the total food varieties expected in the sample.

Food Category	N	Range	Minimum	Maximum	Mean	Standard Deviation
Supermarkets						
Fruits	4	50%	50%	100%	72.5%	22.174
Vegetables	4	20%	70%	90%	77.5%	9.574
All Foods	4	20%	75%	95%	87.5%	0.087
Convenience Stores						
Fruits	12	50%	0%	50%	22.5%	18.647
Vegetables	12	30%	20%	50%	40.8%	10.836
All Foods	12	55%	5%	60%	36.3%	0.191
Open Air Market Stalls						
Fruits	9	60%	10%	70%	37.8%	22.791
Vegetables	14	60%	30%	90%	41.4%	23.487
All Foods	26	100%	0%	100%	40.7%	28.340

Table 3.5

Price of Food Items between Store Types

Food Category	N	Range	Minimum	Maximum	Mean	Standard Deviation
Supermarkets (produce price per kilo)						
Milk	4	0.540	2.910	3.450	3.047	0.269
Beef Steak	4	6.000	14.990	20.990	17.740	3.202
Vegetable	4	1.260	1.760	3.030	2.543	0.545
Fruits	4	0.640	2.030	2.670	2.339	0.261
Convenience Stores (produce price per dozen)						
Milk	7	1.800	3.200	5.000	3.879	0.601
Beef Steak	6	7.000	18.000	25.000	21.750	3.094
Vegetable	7	2.000	2.300	4.300	3.357	0.737
Fruits	7	2.080	0.000	2.080	1.083	0.854
Open Air Market Stalls (produce price per kilo)						
Milk	1	0.000	4.000	4.500	4.167	0.289
Beef Steak	2	22.500	12.500	35.000	20.000	8.789
Vegetable	12	1.972	2.278	4.250	3.533	0.530
Fruits	8	3.325	0.875	4.200	2.730	1.389

Table 3.6

Quality of Food Items between Store Types; 0=no quality; 1=top quality.

Food Category	N	Range	Minimum	Maximum	Mean	Standard Deviation
Supermarkets						
Fruit	4	0.21	0.19	0.40	0.27	8.958
Vegetable	4	0.16	0.28	0.44	0.34	7.411
Convenience Stores						
Fruit	12	0.88	0.00	0.88	0.34	30.835
Vegetable	12	0.70	0.30	1.00	0.66	23.982
Open Air Market Stalls						
Fruit	8	0.70	0.00	0.70	0.49	23.206
Vegetable	12	0.58	0.17	0.75	0.51	16.267

NEMS-S Rankings

The Paraguay adapted NEMS-S tool measures a possible 38 points. The highest scoring store in my sample is 21 (55% of the total 38 possible points); the mean score across all stores is 14 (36.8% of the total 38 possible points). The highest scoring sub-scale is availability: 77% of the total 20 possible points. Most often, stores fail to offer low-fat dairy items, such as low fat milk or low fat yogurt. In many cases where stores offer healthy options, the store priced the healthier option higher than the unhealthy option, which negatively affected the overall affordability measure: 50% of the total 12 possible points. For quality, the produce items scored low: 37% of the total 6 possible points. Residents can access some high quality nutrition but the overall quality of nutrition in stores is poor.

To indicate store rankings, I used the Blom's formula function in SPSS v.20, which transforms proportions into standard percent scores that can be ranked from lowest to highest (Blom, 1958). Then, I assigned a number between 1 and 17 based upon the percent scores (0.0-1.0). When the percent score occurred twice, I reviewed the availability sub-scores (also transformed); the store with a lower availability score received the lower rank; and, the store with the higher availability score received the higher rank. For the sub-scores, I kept the ranks the same; so, some stores cluster at the same level while the overall store rank is individually assigned (see Figure 3.9).

Rank	Store Type
17	Supermarket
16	Despensa
15	Despensa
14	Supermarket
13	Supermarket
12	Despensa
11	Supermarket
10	Open Air Market
9	Despensa
8	Despensa
7	Despensa
6	Despensa
5	Despensa
4	Despensa
3	Despensa
2	Despensa
1	Despensa

Figure 3.9. Store Rank and Type.

The majority of the *despensas* (convenience stores) ranked low or below the median (9.0) except for four of the convenience stores. Supermarkets and the open air market both ranked above the mean. Table 3.7 provides the minimum and maximum ranks and the mean rank for each type of store groups. The four highest ranked convenience stores also scored well on all sub-scales. When I selected the neighborhood, I counted the 4 highly ranked convenience stores; however, between February and July, the month of data collection, I discovered through household interviews that many residents used other stores that were lower ranked and hidden from view. (Also, see Appendix D, Figures D.1-D.3 for subscale box-plot figures by store types).

Table 3.7

Aggregated Store Ranks by Store Type

Food Environment Quality Measures	Supermarkets (N=4)	Despensas (N=12)	Open Air Market (N=1)
Overall Rank			
Mean	13.8	7.3	10
Minimum	11	1	.
Maximum	17	16	.
Availability Rank			
Mean	15.5	6.8	10
Minimum	14	1	.
Maximum	17	12.5	.
Affordability Rank			
Mean	3.5	10.6	11.5
Minimum	2.5	2.5	.
Maximum	6.5	15.5	.
Quality Rank			
Mean	4.5	10	14.5
Minimum	4.5	1	.
Maximum	4.5	17	.

NEMS-S Comparisons

Two independent Samples T-test were used to explore the differences between food stores given their rankings (see Appendix D, Table D.1 & D.2). The first test included the open air market with supermarkets as one group and the convenience stores as another group. The underlying assumption grouping the supermarkets with the open air market is their location downtown and outside of walking distance, while the convenience stores are within a walking distance of residents. I found that the downtown stores are likely to have more food available ($t(11)=4.641$, $p=0.001$) whereas the convenience stores are likely to have more food affordability ($t(9)=2.513$, $p=.035$). Quality, however, is not found to be significant between stores when including the open air market.

In the second test, I excluded the open air market from the sample and focused on comparing the supermarkets with the convenience stores (see Appendix D, Table D.3 & D.4). Again, the supermarkets have significantly more food available ($t(14)=6.797$, $p=0.000$) and the convenience stores are significantly more affordable ($t(12)=4.357$, $p=0.009$). The quality ranking among stores reveals that the convenience stores have better quality foods available ($t(11)=-3.978$, $p=0.002$). The open air market appears as an outlier in the downtown food environment. The food available in the open air market compares with the supermarkets; yet, the quality of the foods available in the open air market contrasts with the supermarkets. The findings are likely due to the fact that the convenience store owners access the open air market to stock their shelves (similar quality).

Remarkably, the supermarkets are not the best source of nutrition which contradicts the previously conceived ideas about the food environment as a whole. The stores lack acceptable fresh food and typically do not provide food at an affordable price. Though supermarkets do have a wider variety of food available, it appears that availability becomes a moot point. Since previous research suggests that residents in less developed countries access supermarkets to purchase food items that are on sale or lower priced (Hawkes, 2008), my findings suggest that it is likely residents purchase those types of items because the availability of fresh produce food items are unacceptable inside of the stores.

Summary of Findings

A perfect score on NEMS-S would mean that the store provides a wide enough variety of healthy, fresh, and affordable food selections to support the basic needs and dietary preferences for local residents (Glanz, Sallis, Saelens, & Frank, 2007). However, my results find that the highest scoring store only scored 55% of the total points. This score indicates the quality of the *city-wide* food retail environment is poor and that a food desert exists in both the neighborhood and downtown food retailing environment in San Lorenzo. Residents are deprived of even and equal access to healthy food varieties in terms of availability and affordable prices in all the local food retailing environments. Deprivation in San

Lorenzo directly ties to the context of food availability and affordability in all the local food retailing environment.

A second factor in food deserts is safe and consistent access to food environments. In San Lorenzo, the factors of walkability and climate variability indicate a food desert. During seasonal rains when roads flood and wash out, it is difficult for food vendors to market their foods. Likewise, residents on roads that flood may be unable to be unable to walk safely or find transportation to access a food source. Finally, the open air street vendors are also at physical risk from street flooding and from local traffic attempting to navigate the flood areas. Wrigley (2002) posited that the fragmented development of a neighborhood food environment indicates a food desert.

In this case study, I tested two primary hypotheses: (a) the smaller, convenience stores will lack fresh food at an affordable price; and, (b) the supermarkets will be the best source of affordable quality food over other food stores in the food environment.

Hypothesis 1.a: The smaller, convenience stores will lack fresh food at an affordable price

Given the current food desert literature, I expected to find that the smaller stores in the neighborhood would lack fresh food at an affordable price. However, my findings suggest that the greatest range of fresh foods exist in the convenience stores. The smaller stores have about half of the items that the supermarkets have; however, they appear to price those items at a more affordable scale than the supermarkets. In summary, the smaller stores do price their food items competitively with the market but the variability (variety) is less diverse. Thus, Hypothesis 1.a is incorrect.

Hypothesis 1.b: The supermarkets will be the best source of affordable quality food when compared with other commercial food stores

Given the current literature and previously conceived ideas about the food environment as a whole, I expected supermarkets to be the best source of nutrition in San Lorenzo. However, my finding indicated that the stores lack acceptable fresh food and typically do not provide food at an affordable price. Though supermarkets do have a wider variety of food available, it appears that food availability becomes a moot point since the quality is poor and the food less affordable than in other local food environment options. Thus, when compared with other commercial food environments, supermarkets are not the best option for affordable, high quality nutrition. Thus, Hypothesis 1.b is incorrect.

Chapter 4

EXPLANATIONS OF HOUSEHOLD FUNCTIONS: SHOPPING IN THE FOOD DESERT

The subjective categories (emic observations) are what residents perceive about their access or how they understand their food environments influence their coping mechanisms (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Jilcott, Laraia, Evenson, & Ammerman, 2009; Kaufman & Karpati, 2007). A small selection of studies based in food deserts focus on human perceptions of local food access and how perceptions influence shopping strategies (Inglis, Ball, & Crawford, 2008; Jilcott, Laraia, Evenson, & Ammerman, 2009; Kaufman & Karpati, 2007). Analyses reveal how people perceive and understand their access to food in their local environments to overcome physical and economic barriers (Inglis, Ball, & Crawford, 2008; Jilcott, Laraia, Evenson, & Ammerman, 2009; Kaufman & Karpati, 2007).

The purpose of this chapter is to identify individual shopping strategies in semi-structured ethnographic and household interviews to understand how household decision makers in San Lorenzo cope through every day choices. I draw upon anthropological perspectives to frame this investigation of household shopping as coping in a food desert. The interpretation of field observations and interview text describes the form and function of local food desert households. I identify the barriers associated with food deserts, which include city structure and access to transportation and local perceptions of food stores. In the final analysis, I discuss the three major assumptions about the ways in which the food deserts influence household shopping decisions and how they relate to coping mechanisms.

Urban households cope with spatially and economically uneven food access (Adair & McDade, 2001; Barg & Kauer, 2005; Galea & Vlahov, 2005; Rose & Richards, 2004). Anthropologists consider households as culturally defined, emic units (Netting, Wilk, & Arnould, 1984). Households have form and function. Form structures the household; function defines what households do (Netting, Wilk, & Arnould, 1984). Household form includes ways to classify and compare households, such as their composition (kinship structure), size, and type of headship (the primary household decision maker) to name a few examples. Household function involves the behaviors its members enact, such as food production (Netting, 1993) or economic production (Wilk, 1991). An examination of household coping strategies operationalizes the adaptive (cultural) function where people share ideas and organize to solve problems that benefit the health and security of their family (Leatherman, 1996; McElroy, 1990).

Until recently, anthropologists rarely designed studies to examine how residents behave and interact with their local food markets, supermarkets, and smaller corner stores to cope in the Global South (Smith, 1998). A study in Cali, Columbia found that food preparers selected to buy food on store credit or to utilize social services instead of relying on their personal relations for food (Dufour, Staten, Reina, & Spurr, 1997). Ethnographic research explained that when people rely on their family and friends for food they feel a loss of autonomy (Dufour, Staten, Reina, & Spurr, 1997). In Africa, researchers found that urban households who vary their coping strategies by relying on multiple sources for food (e.g., local agriculturalists, food markets, and neighbors) improved their food supplies compared to households with less food sources available within their community (Hadley & Patil, 2008).

Other studies focus on the open air markets as food sources that improve local capacity to cope with environmental and economic barriers in the Global South (Pottier, 1999). Local price fluctuations and food shortages remain relatively unnoticed by residents because market vendors self-regulate food prices (Plattner, 1985; Pottier, 1999). In the Global South, poorer urban residents favor open air markets over supermarkets because residents can establish more direct connections with producers and vendors to create store credit lines during periods of low cash flows (Plattner, 1985; Pothukuchi and Kaufman, 1999; Pottier, 1999). The studies of the Global South reveal that an array of formal and informal markets exist in urban environments which influence shopping and coping decisions in positive directions. Thus, in the Global South, urban residence – what people perceive, how they cope, and where they live –may affect their long-term vulnerability (resilience) to economic fluctuations and poor physical and economical access to food stores in food deserts.

Coping in Food Deserts

A key household agent in the food desert is the primary food preparer or food decision maker (Dufour, Staten, Reina, & Spurr, 1997; Jilcott, Laraia, Evenson, & Ammerman, 2009; Kaufman & Karpati, 2007). In households, the decision maker functions to accumulate the resources household members need daily. Food stores facilitate the availability of food resources for household food consumption. Depending on the types of food available, households either find what they need to cook or they adapt their food plans to fit the local supplies (Dufour, Staten, Reina, & Spurr, 1997; Maxwell 1996). Exposure to food deserts amplifies individual risk factors for obesity (e.g., high energy food intakes, low levels of food security) due to the purchasing decisions residents make (Winkler, Turrell, & Patterson, 2006; Wrigley, 2002; Wrigley et al., 2003).

City infrastructure and economic systems create barriers that deprive the household food decision maker from accessing stores in food deserts (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Kaufman & Karpati, 2007). Food deserts are characterized by poor access to stores, including safe and reliable transportation (Burns & Inglis, 2007; Lopez-Zetina, Lee, & Friis, 2006; Pendola & Gen, 2007; Townshend & Lake, 2009). Studies find a combination of formal and informal relationships in the food environment provides the capacity for most residents to cope (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Kaufman & Karpati, 2007); additionally, the 'personal barriers' people create from their subjective perceptions relate to social and economic exclusion and exacerbate individual exposure to health risks associated with food deserts (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Joshu, Boehmer, Brownson, & Ewing, 2008).

Previous research determined that cost, convenience, and produce freshness are key factors to influence individual food choices (Drewnowski & Spector, 2004; Glanz et al., 1998; Kaufman & Karpati, 2007). Specifically, access to credit and cultural capital help residents cope with economic barriers associated with food deserts. Even when food is available in food stores, the prices among food varieties limits some families from purchasing their nutritional needs or food desires. Studies find that many lower income residents select to shop at smaller corner convenient stores over supermarkets because they have access to informal lines of store credit (Graham, Kaufman, Novoa, & Karpati, 2006; Kaufman & Karpati, 2007). Researchers also find that using store credit requires longer exposure and residency in the food desert to accumulate the cultural capital needed to access store credit (Kaufman & Karpati, 2007).

Ethnographic research in a Brooklyn food desert found that residents cope by shopping at the smaller "bodegas" or neighborhood stores over supermarkets (Graham, Kaufman, Novoa, & Karpati, 2006;

Kaufman & Karpati, 2007). Residents explained that the price of food at the bodegas was a little higher than supermarkets, but residents selected the bodegas because they can access store credit (Kaufman & Karpati, 2007). Residents explained that using store credit requires the establishment and maintenance of a social relationship with the store staff over many years (Kaufman & Karpati, 2007). Thus, the shopping experience is highly interactive and often. The advantage of accessing local stores (albeit more expensive than supermarkets) suggests that households employ successful coping mechanism based upon their social and cultural capital in their local neighborhood stores (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Graham, Kaufman, Novoa, & Karpati, 2006; Kaufman & Karpati, 2007).

Researchers also find that negative coping strategies can emerge from local perceptions in the food desert (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Dobson, Beardsworth, Keil, & Walker, 1994). Residents identify 'personal barriers' that prevent them from accessing some types of stores (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009). Personal barriers result from local perceptions relating to the level of social and economic exclusion people feel when they shop. One study found that residents felt uncomfortable in supermarkets because shopping without a credit or debit card embarrasses them (Bower, et al., 2009). Similar research found that shoppers felt excluded through their food selection because their food budgets set them apart from other shoppers (Dobson et al, 1994). In both cases, residents selected to shop at slower times during the day or vary their shopping among stores (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Dobson, Beardsworth, Keil, & Walker, 1994).

A coping perspective considers how cultural norms translate into health concerns and well-being (Leatherman, 1996; McElroy, 1990). The food decision maker has greater exposure and susceptibility to the environmental and economic barriers that require a coping response in food deserts (Jilcott, Laraia, Evenson, & Ammerman, 2009; Kaufman & Karpati, 2007). The function of the decision maker acts to reduce poor physical distance to stores and economic factors in food price by using their social and familial networks to share food and rides to the stores or the ability to store bulk foods in households so fewer shopping trips are needed (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Dibsdall, Lambert, Bobbin, & Frewer, 2003; Dibsdall, Lambert, & Frewer, 2002; Wilson, Alexander, & Lumbers, 2004). In this case, I explore household interviews to answer the hypotheses listed in Table 4.1.

Table 4.1

Hypotheses: Residential Perceptions of Access and Subsequent Coping Strategies

2.a Residents will identify poor access to transportation as a key factor in their decision to shop at a store.
2.b Residents will identify access to store credit as a key factor in their decision to shop at a store, and the lowest income residents will utilize store credit services when shopping for food.
2.c Personal barriers will emerge from interpretation of household shopping strategies

Household Forms: Sample Demographics

Table 4.2 displays the types of households in the sample. The majority of the families are nuclear (with parent and biological children only). Less than a quarter of the household include grandparents or great aunts and uncles. A small percentage of households are sibling only (horizontal households) and a very small number include renters or non-kin members. The average household size was 4.88 years (range 1-12 years, standard deviation=2.243).

Table 4.2

Classification of Households by Composition

Type of Household	N	%
Nuclear Household	38	55.9
Multi-Generational Household	15	22.1
Horizontal Household	12	17.6
Non-kin Household	3	4.4
Total	68	100

The majority of the household heads are female (80%). I found that 30% of the female population state that they share responsibility of household economic and financial decisions with their male spouses. The level of educational attainment varies, but almost half of the population lacks a secondary (high school) education (see Table 4.3). Table 4.4 displays the types of jobs held by male and female household heads. Primarily, female heads are housewives, domestic workers, or in sales and retail. Male household heads work in a variety of occupations, and most of them are downtown or outside of the neighborhood.

Table 4.3

Level of Educational Attainment for the Household Head

Education Level	N	%
Little to No Education	2	2.9
Primary School	31	45.6
Secondary School	28	41.2
Technical College or University	7	10.3
Total	68	100.0

Table 4.4

Occupations for Male and Female Household Head

Occupation Classification	Male	Female	Total
Housewife	0	22	22
Domestic Worker	0	12	12
Sales and Related Professions	2	11	13
Construction and Extraction Professions	3	0	3
Transportation Services	2	0	2
Office and Administrative Support	0	1	1
Healthcare Employees and Support Service	0	2	2
Municipal and National Protective Service	1	0	1
Agriculture and Food Manufacturing	1	0	1
Factory and Manufacturing	3	0	3
Collect Plastics	0	2	2
Newspaper Reporter	0	2	2
Retired (on Pension)	1	2	3
Student	0	1	1
Total	13	55	68

Across all households, ages of the household members range from newborns (3 months) to elderly (90 years old). The average age across the household rosters was 28 years old. Approximately 33% of all the household members with income earn below the international poverty line for urban areas (less than $2US per day). Table 4.5 provides the descriptive statistics for all income earners across the households. In the lowest quartile, income earners make 50,000 *Gns*, or 50 *millión Gns* a month (approximately the cost of 2 kilos of beef at the supermarket). Between households, approximately 35% of the households have a total monthly income less than the standard minimum wage in Paraguay (1,500 *millón Gns* or $350 USD). The mean income for all households is 2,685 *millón Gns*; the median is 2 *millón Gns*. Table 4.5 provides the descriptive statistics for variation in household income (accumulation of all incomes within households).

Table 4.5

Descriptive Statistics of Monthly Income in Gns

Population Sample	Minimum	Maximum	Mean	Standard Deviation
Individual	0	5,500,000	1,017,572	1,069,462
Household	0	13,795,000	2,684,479	2,483,576

Household Food Decision Makers

The average age of the household food decision maker was approximately 43 years old (range 17-84 years, standard deviation=16.66). The lowest age quartile included ages 17 to 26 years old. The highest quartile of the total population lived in their residence for 55 years or more. Generally, women made the household food decisions; however, I did find some men (7%) who also made food decisions (see Table 4.6). Three quarters of the household food decision maker acted as the household head as well. Ten percent were the spouse of the household head, and the remaining proportion was either a child of the household head (7%), an extended family member (5%), or an in-law (3%). Table 4.7 provides the details of the relationships with the household head.

Table 4.6

Gender of the Household Food Decision Maker

Gender	N	%
Female	63	92.6
Male	5	7.4
Total	68	100

Table 4.7

Relationship of the Household Food Decision Maker to the Household Head

Relationship Type	N	%
Household Head	51	75
Husband or Wife	7	10.3
Biological Child	5	7.4
Son or Daughter -in-law	1	1.5
Step Parent	1	1.5
Parent-in-Law	1	1.5
Sibling	1	1.5
Nephew or Niece	1	1.5
Total	68	100

Each household food decision maker had some level of educational attainment. The majority, however, attained lower levels of education (see Table 4.8). The majority of the population (43%) classify as housewives only. Twenty-two percent, of the sample population work in sales or retail; 13% of the population take on extra domestic work (laundry, house cleaning, and day care) outside of their own house. In Table 4.9, I provide the classification of occupations by male and female food decision makers.

Table 4.8

Level of Educational Attainment for the Household Food Decision Maker

Educational Level	N	%
Primary School	29	42.6
Secondary School	28	41.2
Technical College or University	11	16.2
Total	68	100

Table 4.9

Occupations for the Household Food Decision Maker

Occupation Classification	Female	Male	Total
Housewife	27	0	27
Sales and Retail	14	1	15
Domestic Worker	8	0	8
Student	4	0	4
Healthcare Employees and Support Service	2	0	2
Newspaper Reporter	2	0	2
Retired (on Pension)	2	1	3
Not Employed	1	1	2
Office and Administrative Support	1	0	1
Hairdressers, Stylists, and Cosmetologists	1	0	1
Collect Plastics	1	0	1
Construction and Extraction Professions	0	1	1
Agriculture and Food Manufacturing	0	1	1
Total	63	5	68

The Rio Barrio: Field and Interview Observations

Just north of a shallow stream that flows through San Lorenzo sits the neighborhood, *Rio Barrio*. At the center of the *barrio*, the oldest houses line the cobbled-paved streets. The construction materials for the older homes are brick and ceramic materials. On the periphery, newer houses use less secure housing materials, including wood and tin. All houses have fences for protection from thieves. The older houses use brick, stone, and metal materials for fencing while the newer homes use barbed wire and wood to fence their property. The houses on the periphery of the study site constitute *villas*. Residents there explained that v*illas* are the poorest areas and stretch along unwanted or unusable land. Residents in the *villas* were described as the people who live 'day-to-day' (the most economically insecure and vulnerable residents).

Figure 4.1. Photos of *barrio* houses; left: more secure housing; right: less secure housing.

On the banks of the shallow stream stretches one of the *villas*. At one end of the stream, a community park with a tap serves as their primary access to water. Another *villa* sits below a power line which gives off a buzz because too many residents tap into the power line. Water for this *villa* is piped from the land manager's well and into the houses. The third *villa* is very small and more densely populated. There are two main clusters: one is more secure housing (e.g. brick and stucco) and has city water piped into the property; while the other is a cluster of houses with less secure building materials and water is shared through a well.

Figure 4.2. Photo of a park entrance in San Lorenzo.

Scattered throughout the *barrio* are a number of parks and plazas. Children play in these areas and they are kept clean by residents. At one of the park entrances, there stands a pillar with a message that acts as a warning to the local residents (see Figure 4.2). An English translation of the message is: When we cut the last tree, when we contaminate the last river, and when we kill the last fish, you will realize that money cannot be eaten. The pillar indicates that residents struggle with changes in their natural environments and changes in the economic structures that provide access to the resources which residents need to live. The extent to which residents share this belief is further explored in ethnographic interviews.

A common reason for moving into the barrio was to live closer to family as reported to me by study participants. Other reasons included the “urban lifestyle” as quoted to me by a number of study participants as meaning more job and educational opportunities and more independent living from rural family life. The “urban lifestyle” translates to mean that there is more to do, and the term is mutually exclusive from being close to one’s family.

Table 4.10

Common Reasons Residents Moved into the Neighborhood

Reasons	N	%
Lived here their whole life	13	19
Urban Lifestyle	20	29
To Live Closer to Family	21	31
Purchase/Own Property	14	21
Total	68	100

Some residents reported that they had lived in their house all their life or that their family had owned the home for generations. Others stated they came to purchase property when the prices were lower years ago. The average length of residency for households was 15.4 years (range 0-52 years, standard deviation=11.61). The lowest quartile of the population lived in the neighborhood for up to 4 years; the highest quartile lived in their residence for 24.5 years or more.

The early morning risers are the household food decision maker and any household members who are employed and require passage on an early bus into the city. At dawn, those household members wake up and begin drinking mate or coffee, preparing breakfast, and conducting household chores. If the household has children, the food decision maker wakes her children up, dresses and feeds them some bread; then, they walk to school together. Later, the food decision maker usually picks the younger children up from school and walks them home for lunch. After lunch, the older children go to school and return later for dinner. For dinner, families eat something small, like a sandwich or an empanada. And, for some families, everyone skips dinner.

In Interview SL08061, HG001, the food decision maker stated:

> *En un día, me levanto le hado el desayuno a mi marido. Él se va a trabajar después desayuno. Yo le hago desayunar a mi hija, cocino. Después le baño, le visto, y le llevo a la escuela. Después viene mi marido de su trabajo le doy de comer, y después me paso limpiando la casa a la tardecita, después le hago la merienda, después la cena, y después nos acostamos a dormir.*

> Translation: In a day, I get up and make breakfast for my husband. After he goes to work, I eat breakfast.

Then, I make breakfast for my daughter. I cook. After, I bathe her, dress her, and take her to school. After, my husband comes home from work and I serve him food. Then, I clean the house in the afternoon, after that, I make a snack and then dinner, and then we go to bed.

In Interview, SL08066, HG001, the food decision maker stated:

[Cada día] limpio mi casa. Después, me voy al almacén, cocino, lavo las ropas. Me levanto a las seis y cuarto ya me levanto yo por que mi hijo se a trabajar a la seis y cuarenta... [Para desayuno le hago] cocido con leche porque café no le gusta a [mi hija]... [Después] yo cocino y ellos vienen a comer algunas veces, pero algunas veces no, cuando se van un día no vienen luego a comer... [Pero cuando vienen] que hago puchero, guiso de fideo o arroz de soja hago albóndiga, empanadas al horno y para la cena ya cualquier cosa hago, algunas veces hago tortillita pero no es que hago todos los días alguna veces sino. Hago pan con, pan de sándwich, tostado o empanadas al horno.

Translation: Each day, I clean my house. After, I go to the store. I cook and wash clothes. I wake up at 6:15 to wake up my son who works at 6:45. For his breakfast, I make him cocido with milk because he doesn't like coffee. Then, I cook and the other kids come to eat sometimes, but sometimes they don't come to eat. But when they do come, I make *puchero, guiso de fideo*, or rice with soy sauce. I make meat balls, baked empanadas; and for dinner, I make whatever I have. Sometimes I make a tortilla but I don't always make dinner each day. I'll make something with bread, like a sandwich, or toast, or baked empanada.

Throughout the day the food decision maker conducts a list of chores: clean house, wash clothes (by hand), cook lunch (slow cooked for at least 2 hours), and care for any dependents (young children, older relatives). In the morning, the younger children go to school; and, in the afternoon, the older children attend school. The household food decision maker is usually home all day. In the afternoon, most decision makers take a nap or rest; then, they clean the house a second time before the older children return home from school. Whoever is around the house will help with household chores; however, some decision makers stay home alone most of the day.

Below are more examples of household routines that include chores. The first quote mentions how she rests during the afternoon. The second quote mentions how she conducts the household chores alone. The final quote really emphasizes how much effort cleaning the house takes in San Lorenzo, particularly in households with very poor structural materials.

> *Primero, le preparo el café a mi nena y a mi marido. Y, después de eso, comienzo ya a lavar los cubiertos y depende de si tengo mucha ropa ese día lavo la ropa... y comienzo a limpiar la casa después ya hago algo para comer un poco algo y después para tomar tereré y después cocino le preparo a mi hija después cuando se va mi hija ... duermo, veo un ratito la tele me despierto y comienzo a barrer algo por el patio así siempre hay algo planchar y después ya se va mi marido a trabajar de noche trabaja él y la preparo su uniforme y eso y después se va a trabajar y después ya no hago más nada veo tele cuando le espero a mi hija en el transporte ...y después tomamos café y después ya nos acostamos y después ya no hago más nada (from Interview SL08010, HG001).*

Translation: First, I prepare coffee for my child and husband. Then, after that, I begin washing dishes and depending on how much dirty clothes I have, on that day, I wash clothes… and, I start cleaning the house. After, I make a little something to eat and then, I drink tereré and after I cook and prepare food for my child. After she leaves, I sleep, watch a little TV, get up and begin to sweep the patio, and I always have something to iron. Then, my husband leaves to go to work, I prepare his uniform and then he goes to work. Then, I don't do anything. I'll watch TV while I'm waiting for my daughter to come home on the bus. And then, we drink coffee and we go to bed, and I do nothing else.

Me levanto más o menos las siete seis y media por ahí este después doy vuelta por ahí y cocino porque mi hija tiene que comer para las once y media y este me pongo a lavar ropa después si falta algo compro acá en el almacén después barro mi patio rego las plantas lavar los platos y todo limpiar la casa porque no tengo ayudante siempre eh tenido ayudante tres veces por semana pero ahora no tengo y tengo que hacer todo yo (from Interview, SL08059, HG001).

Translation: More or less, I wake up at 7, 6:30, something like that. Then, I mosey around and start to cook because my daughter needs to eat by 11:30. Then, I wash clothes, and after if I need something, I buy it here in the neighborhood store. Then, I sweep my patio, water my plants, wash the plates, and clean the whole house because I don't have anyone to help me. I used to have help three times a week but now I don't have anyone and I have to do everything myself.

Me levanto me lavo la cara me cepillo y después tomo mate y después a las cinco ... desayuno y me levanto a barrer a las seis y media siete las ocho por ahí barro si hay demasiado humedad espero más tarde eso y después que te digo barro todo por todas partes y algunas veces cuando esta seco es grande algunas veces barro acá barro allá barro, barro ya es la ocho y media entonces barro todo y ya me voy en la despensa a traer la carne porque yo todo los días compro carne (from Interview, SL08005, HG002).

Translation: I wake up, wash my face, and brush my teeth. Then, I drink mate and after 5 ... I eat breakfast and start sweeping at 6:30, 7:00, 8:00, sometime like that. If it's too humid, I wait until later to sweep and then I

> 'gotta tell you' I sweep everything everywhere and sometimes when it's dry, it's a lot of work, sometimes I sweep here, I sweep there, I sweep, I sweep, and it's already 8:30! So, I sweep everything. Then, I go to the despensa to buy meat because I buy it every day.

While the youngest children are at school in the morning, some households shop for food in a nearby *despensa*. Occasionally, household members will pick up some food at a supermarket downtown on their way home from work or the food decision maker will run to a neighborhood store, but generally the primary supermarket shopping is done in bulk and on the weekends.

Figure 4.3. Photo of residents shopping for food; left: shopping at a market vendor downtown; right: walking home with manioc from a despensa in the barrio.

Some food decision makers define nutrition with two local categories. When preparing a meal, the decision maker considers two kinds of meals: "caldo" meals (e.g., soup or stew) and "dry" meals (e.g., pasta, rice, or bread meals without juice or sauce). "Caldo" refers to a soup cooked in one pot. *Caldo* meals are watery and wet; whereas dry meals, referred to here as “seco,” contrast the wet meals. Figure 4.4 shows common “dry” meals. Some households alternated between these meals to create a balanced diet. Others alternated between these meals depending on taste and preference. In every case, food decision makers explained that a diet of wet and dry meals provides nutritional variety.

Figure 4.4. Photo of common “dry” meals in Paraguay; left: fideo (with chicken and potatoes); middle: asado with rice salad and sopa Paraguaya (cornbread); right: milanesa (fried beef or chicken steak) with rice salad.

The following three quotes best describe the difference between *caldo* and *seco* meals, including how they depend on these meals for a healthy and balanced diet.

> *Hago caldo, poroto. Otro día hago seco que es guiso, u otro día hago otra vez eh, como es caldito, como dice la sopa otro lado verdad (jajajaa) y así intercalado hago… pero no frito todos los días… [INTERVIEWER: Que significa seco?]… Seco, yo digo, ese que es… sin jugo; que no tenga nada de… jugo… [Seco] una comida solida, eso solida, y… sopa*

le dicen la mayoría de países que tiene jugo así caldito como le digo no es seco, nosotros le llamamos acá (from Interview, SL08036, HG001).

Translation: I make '*caldo*', or a *poroto* (black bean soup). Another day, I make '*seco*', such as *guiso* (fat grizzle on meat or chicken). Then, on another day, I make something else, like a little '*caldo,*' in other countries they call it soup, right? (hahaha), [Interviewer: what does 'seco' mean?] '*Seco*', I tell ya, it's without juice (or sauce); it doesn't have it any juice. '*Seco*' is solid food, it's solid, and soup, as they say in most countries, has juice like '*caldo,*' as we call it here.

Hay que hacer dos comidas distintas caldo y después seco que a mí por ejemplo me gusta seco pero a los otros les gusta el caldo… Cuando es seco pues generalmente se hace una milanesa con arroz y como siempre nos recomiendan los pediatras por qué mejor es que coman un caldo bien consistente [con carne y vegetales] ante que la fritura y todo eso (from Interview, SL08060, HG002).

Translation: You gotta make two distinct meals, '*caldo*' and after '*seco*'. I, for example, like '*seco*' whereas others like '*caldo*.' … When it's dry, generally, they make *milanesa* with rice and the pediatricians always recommend that it's better that we eat a hearty (with meat and vegetables) caldo than the fried (*milanesa*)

Lunes miércoles y viernes hago puchero y martes jueves y sábado hago seco y los domingos comemos si hay chorizo… con eso nos alcanza … gracias a dios no nos falta todavía para comer (from Interview, SL08029, HG001).

Translation: Monday, Wednesday, and Friday I make *puchero* (stew) and Tuesday, Thursday, and Saturday I make '*seco*' food. And, on Sunday, we eat *chorizo* (sausage) if there is any... with that we stock up... thanks to God, we don't lack food.

Content Analysis

I conducted content analysis on 66 interviews for three major codes: city infrastructure, transportation, and food stores. I counted a total of 19,181 paragraphs (average mean of paragraphs is 291 per interview). Across the interview texts I counted the total number of words and conducted a word frequency to identify common indicators to code for transportation and food stores. The total number of codes for transportation is 849; the total number for food stores is 1304. The codes cover about 11% of the total text. The remaining text includes daily routines and meal planning strategies, as discussed above. For city infrastructure, I coded for themes on the short answers respondents gave concerning their list of advantages and disadvantages associated with living in San Lorenzo. Then, I performed saliency tests on the list items. The following sections detail the results and interpretations of the three primary content codes.

Word Frequency

In MAXQDA, I ran a word frequency across all the documents. I excluded any superfluous words (um, ok, sí, no); I also excluded numbers and words with less than 0.01% coverage. Table 4.11 displays the top 25 words across all the documents. Temporal words are common (day, week, and month). *Despensas* are discussed more than any other store; supermarket is second most common, and open air market is less common. Meat is the most commonly mentioned food item, and milk is the second most common food item mentioned.

From the full list of words, I created a dictionary in MAXQDA that allowed me to perform lexical searches on word indicators; and, I auto-coded the text transcripts based upon indicators. After coding on indicators, I read each line of text to find errors or other indicators I might have missed. If I found those, I added them to the list, re-ran the search, and then read through the transcripts. I weighted codes 0=prompt and 1=response. Only the responses were added to create content codes for transportation and food stores.

Table 4.11

Word Frequency across all Household Interviews

Word	English Translation	Word length	Frequency	%
comida	meal	6	787	2.51
casa	house	4	626	2.00
día	day	3	609	1.94
semana	week	6	556	1.77
mil	mil (currency)	3	528	1.68
carne	meat	5	432	1.38
mes	month	3	429	1.37
trabajo	work or job	7	375	1.20
leche	milk	5	374	1.19
despensa	store	8	372	1.19
días	days (plural)	4	359	1.14
súper	supermarket	5	306	0.98
comer	eat or feed	5	300	0.96
hijo	child	4	278	0.89
come	eat or feed	4	272	0.87
marido	husband	6	272	0.87
mercado	city market	7	267	0.85
agua	water	4	265	0.85
alimento	nutritious food	8	250	0.80
cocina	cook	6	242	0.77
plata	money	5	241	0.77
años	years	4	239	0.76
mama	mother	4	238	0.76
compra	shop or purchases	6	227	0.72
caro	expensive	4	223	0.71

The indicators I used related to transportation routes (*línea, calle, camino, or ruta*), transportation costs (*pasaje*), and modes of transportation (*moto, pie, caminar, anda, coche, auto, collectivo, camioneta, taxi*). The indicators for supermarkets involved any variation of the following words: *super, supermercado,* and *hipermercardo.* I coded on specific store names as well and replaced their name with a store

ID. For *despensas*, indicators included any variation on the words: *despensa, mini mercado, tienda, almacén,* and *autoservicio*. For the open air market, indicators included: *mercado, mercado municipal,* and *mercadería*. Then, I collapsed store codes into one category called food stores.

City Infrastructure and Transportation

Most respondents listed 2-3 examples for each question regarding living in San Lorenzo. The perceptions are extreme opposites. The environment is clearly being contested between two populations. During the interviews, I realized that some respondents would answer none for one question, and others would answer none for the other. The majority, answer for both. The response, “none” was coded and is a highly salient perception in both categories.

Table 4.12

Top Ten Advantages of Living in San Lorenzo

Advantages	Frequency (%)	Average Rank	Salience
Educational Opportunities	32.4	1.64	0.250
Close to Supermarket	19.1	1.77	0.142
Occupational Opportunities	17.6	1.58	0.136
Close to Hospital	16.2	2	0.108
Tranquil Environment	13.2	1.56	0.105
Share with Family	11.8	1.63	0.093
Close to Marketplace	10.3	2	0.071
Access to Bus	10.3	2.29	0.058
None	8.8	1	0.088
Cheap Utilities	8.8	1.5	0.069

Table 4.13

Top Ten Disadvantages of Living in San Lorenzo

Disadvantages	Frequency (%)	Average Rank	Salience
None	30.9	1	0.309
Insecurity	13.2	1.56	0.112
Thieves and Poverty	13.2	1.44	0.110
No Occupational Opportunities	11.8	1.38	0.103
Lack of Transportation	10.3	1.29	0.088
Polluted Environment	8.8	1.5	0.071
Poor Infrastructure and Roads	7.4	1.2	0.066
Not Tranquil Environment	4.4	1	0.044
Far from the Highway	2.9	1	0.029
Expensive Prices at the Market	2.9	1	0.029

Content describing transportation reveals concerns for safety and security when attempting to access the downtown shopping district. For example, in this first quote, the respondent selects the bus unless one of her children is with her. They own a motorcycle at the house but she doesn't like to ride it because they are dangerous, and other drivers don't look out for them.

No peligroso es la moto es peligrosísima. Nadie le respeta a las motos [en la ruta principal] (from Interview, SL08011, HG002).

Translation: The motorcycles aren't just dangerous, they're really really dangerous. No one respects the motorcyclists on the main road.

In this second quote, a respondent explains that the city bus system isn't safe either, and the city lacks security.

Pero ahora hay demasiado muchos ladrones. uno no puede mas salir tranquilo. En el colectivo mismo alguien te aprieta, te saca tu celular, te saca tu plata, tu cartera. Queremos mas seguridad, eso lo que hace falta,... pero creo que no es acá en Paraguay solo, en Argentina, Brasil, así todo, todo ladrones (from Interview, SL08001, HG001).

Translation: But now, there are way too many thieves. One can't go [travel] in peace. On the bus, someone crowds you; take your cell phone, your money and wallet. We want more security, that's what we lack.

Food Store Perceptions

The local perceptions of stores include descriptions of food price and availability. In particular, the price and availability of meat influences the decision to shop at one store over another. The first quote comes from a household that shops at the supermarket and reveals that the food decision maker can employ her husband to help assist with the food shopping, so buying in bulk and transporting the food is much easier. The second quote explains that it seems to her that the price of meat varies between the supermarket and the *despensa*, so she selects the less expensive option. In the third quote, the respondent explains that she buys less than other people because she doesn't prepare meat every day; her stated reason for shopping downtown is that meat is always cheaper at the supermarket.

Compra de la súper noma, o con mi marido, o yo con mi hija a veces, nos vamos a traer harina, arroz, azúcar, y eso del súper es más barato. Carne nosotros nos acostumbramos mas a comprar del súper porque es más barato del almacén poco, porque [carne] es más caro y la ventaja que ya trajimos todo a casa solamente leche, pan, y eso lo que compramos del almacena si cuando nos falta la mayoría compramos del súper si se acostumbra luego mi marido cuando él trabaja en el centro vino del súper y ya me trae todito cuando él no puede me dio la plata y yo me voy con mi hija (from Interview, SL08023, HG002) .

Translation: I shop from the supermarket, or with my husband, or my daughter and I sometimes. We go to get flour, rice, sugar, and other stuff from the supermarket, it's cheaper. We usually buy our meat at the supermarket because it's a little cheaper than the local neighborhood store. Because meat is expensive (in general) and the advantage (of shopping at the supermarket) is that we can bring (more) home (from the supermarket). So, only milk, bread, and whatever else that we buy at the neighborhood store is when we lack something at the house. We buy most of our stuff at the supermarket, because that is what we're used to doing. When my husband is working downtown, he goes to the supermarket for me, and when he can't go, he'll give me money and I'll go with my daughter.

Para mí, si un poquito más caro [en la despensa tan en el súper], en algunas cosas, hay cosa que igual y hay cosas que un poquito más caro como la carne (from Interview, SL08025, HG002).

Translation: For me, the despensa is a little more expensive than the supermarket; some things are equal, and some are more expensive, like meat.

Carne traigo del súper así un kilo, un kilo y medio... porque... no todos los días preparo comida de carne y... la carne... siempre consigo más barato en el súper (from Interview SL08036, HG001).

Translation: I get a kilo or a kilo and ½ of meat from the supermarket because I don't prepare meat every day in meals and the meat is always cheaper at the supermarket.

The word frequency report of the semi-structured interviews finds meat as the most salient food item mentioned across all the interviews. I selected all text surrounding meat and I found that families with more income and relationships in the market downtown accessed (perceived) better quality meat. However, families with less income and less household durables must shop each day for their meat. Therefore, they shop more conveniently at a *despensa* near their house. One quote below reveals that the respondent perceives the *despensa* will have the freshest cut for the day, and prefers to shop nearby because it's better than shopping downtown.

> *[Compro carne] de la del [súper] y algunas veces esta caro allá me voy. Tengo un cuñado que tiene trabaja en la carnicería… y me voy junto a él y de ahí traigo linda carne pero es caro, lo mismo es caro (from Interview SL08004, HG001).*

> Translation: I buy meat at the supermarket, and sometimes it's expensive where I go. I have a brother-in-law that works at a butcher shop… and with him, I go and buy very lovely meat but it's expensive like the supermarket.

> *Me voy en la despensa a traer la carne porque yo todo los días compro carne no yo no puso en la heladera porque algunas veces [la heladera] no conserva [y] en el calor [es el] mismo. Ya tiene otro gusto entonces (from Interview SL08005, HG002).*

> Translation: I go to the despensa to get meat because I buy meat every day, I don't put meat in the refrigerator

because the refrigerator does not conserve (energy) well and it's the same in the heat, so it loses quality and taste.

Compro la carne más de mi despensa porque... es más rápido más fresco más nuevo (from Interview SL08016, HG002).

Translation: I buy meat more often in my neighborhood store because it's quicker, fresher, and newer.

Interestingly, the analysis of meat prices returns the discussion to the political economy of Paraguay. Some residents compared the differences between meat prices in the past (under a dictatorship) and in current times (under a democratic and capitalist nation). Their perceptions demonstrate how the local food environment and its political economy reflect broader political and economic structures that victimize local residents.

Yo pienso que [rising food prices] es así por los asuntos de los políticos entendes? Los liberales te si entra dice que va a bajar más y después ellos mismos se agarran por eso están la mayoría está cerrado de acá la chura era más barato y nosotros comprábamos de acá ahora es más caro también y por culpa de ellos se cerraron esta mataderia y por eso esta el municipal interino esta Colorado antes eran los liberales que le abrían (from Interview, SL08027, HG001).

Translation: I think that rising food prices is like this, by the affairs of the politics, understand? The liberals, they tell us that if they enter office they will lower [prices] more and then those same men get trapped by the Colorado Party which is why the stores are closing here. Meat used to be really cheap and we would buy it from here (San Lorenzo) but now it's more expensive also. It's the Colorado politician's fault for closing down the meat factories and it's for this reason that the city infrastructure is 'Colorado.' Before, when it was liberal (labor party) things were open.

The location of a store also matters most when residents select to shop at the *despensa*. As seen in the examples above, *despensas* are used when people need to shop every day and are unable to store and preserve fresh food in bulk. The following quote comes from a household that uses the *despensa* nearest to their house. The decision maker explains that the *despensa* has everything that she needs at a relatively affordable price. She also highlights another slice of the political economy in the San Lorenzo food environment. The *despensas* buy in bulk from the open air market. Then, they sell the bulk products in pieces to residents (Incidentally, the *despensa* chosen by this resident is also one of the highest overall ranked *despensa* in the *barrio* found in Chapter 3).

[Compro a la mini mercado] de ahí a una cuadra más o menos tiene todito carne pollo lo que vos quieras y no

esa tampoco muy caro por que traen en cantidad y casi como en el súper es y no dan muy caro las cosas un aceite de un litro sale once mil nomas ahí y en los otros almacenes sale trece así como en las calles que se venden no sé si es de contrabando pero es más barato (from Interview, SL08040, HG001).

Translation: I shop at the neighborhood store nearby a block or so. It has everything, meat, chicken, whatever you want and it's not too expensive either because they buy in bulk just like they do in the supermarket and they don't charge very much. There, a liter of cooking oil only cost 11,000 *Guaranies*; in other stores, it costs 13,000 *Guaranies* just like the street vendors, I don't know if it's contraband, but it's cheaper.

The *despensas* have another quality about them beside their walkability; they offer store credit, "dar libreta." When I randomly selected households, I randomly selected *despensa* owners, who were also the household food decision maker. In the following quote, one *despensa* owner describes her business to me.

Una despensa es cuando contiene las necesidades básicas para una casa como ser aceite harina arroz fideo verduras en general frutas y cosas dulces como ser tortas cada una de esas una despensita contiene esas *cosas que son los principales el pan la galleta entonces con eso la gente se mantiene que haya azúcar por sobre todo azúcar pan y leche vos tenés en una despensa ya podes desenvolverte porque porque una gente pobre por ejemplo lo que más utiliza es la leche el azúcar café o bien la yerba para hacer cocido por ejemplo porque somos personas insolventes prácticamente verdad la mayor parte de la gente son insolventes acá en Paraguay por eso es que se usa mucho la despensa. ese es la base principal para tener una despensita (from Interview, SL08030, HG001).*

Translation: A despensa is when you have all the basic necessities for a house such as cooking oil, flour, rice, pasta, general vegetables, fruit and sweet things, it could be cake. A despensa has each of these things, which are the basic necessities bread, bread rolls and with that people get by. There's sugar above everything, sugar, bread, and milk. That's what you need. You have that in a *despensa* you can improve your standard of living because... poor people use most often milk, sugar, coffee, or even better, yerba to make cocido for example because people are practically impoverished. The truth is most of the people here are impoverished in Paraguay and that's why they use the *despensa* a lot. That's the foundation of having a *despensa*.

During the interview, the owner explained to me about the '*libreta*' system, and I asked her if she ever has a family not pay off their debt. She responded:

Con bendición de Dios, no tengo ese inconveniente porque cuando yo voy a dar libreta le digo bien las cosas como son porque si yo tengo un capital voy a poder desenvolverme mejor. Pero ese es lo que yo no tengo. No tengo capital entonces de lo que a mí me entra únicamente yo puedo ir cargando en mi despensa entonces ellos al cobrar en el mes como mas tardar, que ellos cobran entonces ellos me abonan lo que me deben entonces de esa plata vuelvo a cargar en su totalidad el negocio. Así hago (from Interview, SL08030, HG001).

Translation: Thanks be to God, I don't have that problem [people not paying off their store credit] because when I give "libreta," I tell them how it's gonna be: if I have capital, I'm able to improve my store, but I don't have it (capital), I can't. I don't have capital, so I can only supply what I can carry here in my *despensa* for them. So, they [clients] pay monthly at the latest. The clients repay what they owe me and with that money I can completely restock my business. That's how I do it.

The *despensa* owner went on to describe her perspective about *despensas,* and their placement in the social fabric of the food environment.

Me siento muy bien porque comparto con cada una de las personas… entonces ellos me conocen ya a mi no es una persona que viene a chismosear solamente en una despensa porque hay personas que vienen chismosea nomas en una despensa y acá por ejemplo no es así eso es una de las diferencias que yo tengo en mi despensa (from Interview, SL08030, HG001).

Translation: I feel really good [about my business] because I interact with (get to know) every person, so they already know me. It's not just that people come in to gossip, because there are people that just go to the despensa to gossip, but here for example, it's not like that. That's one of the differences that I have in my store.

A user of the "libreta" system explains that some *despensa* owners are patient when you shop on credit while others are not. The quote highlights that finding an owner who is trustworthy and understanding of economic insecurities can be difficult. She goes on to say that she has a wonderful owner who understands her hardships and works with her.

> *Sube [precio] más cada día cada mes… no baja nada y ese mi libreta comprende la señora pero hay otro lado que vos tal fecha le decís y esa fecha tenés que pagarle y a cada rato luego te pide la plata para que vos le pagues y ahí no te comprende ellos no te comprenden… La señora de la despensa… sabe esperar porque sabe comprender tu necesidad…y a veces te ayuda también… Tiene mucha confianza hacia nosotros, hee eso es importante (from Interview, SL08010, HG001).*

> Translation: The price raise more every day, every month… it never lowers at all and the *despensa* owner with her '*libreta*' gets it. But, there is the other side that some *despensa* owners tell you a date and you have to pay them on that date. And, every moment after that they nag you to pay off your debt; they don't understand you at all. My despensa owner knows how to wait

> because she understands your needs and sometimes she'll help you too. We can always count on her to trust us, yes, this is important.

Very few respondents mention positive aspects of the open air market. The primary factor is price; however, the experience shopping at the open air market prevents many residents from accessing the lower prices. The best description of open air markets comes in contrast with the other downtown stores (e.g., supermarkets), and most people refuse to shop at the market because it is unsafe and unclean. Furthermore, shopping at the market increases your risk for being robbed. For those who select to shop at the open air market, they also find the experience risky but the advantage over price influences their decision.

El mercado municipal… [Hay] ventajas pero más peligroso.

> *En precio hay mucha ventaja y más esfuerzo por qué tenés que saber comprar buscar en el lugar porque también varían los precios por que te vas comprando y mucha carga y es más difícil… las gentes generalmente se van a pie cuando van a traer pocas cosas de acá van a pie hasta el mercado municipal porque hay muchas ventajas y más calidad también hay en los súper de repente la higiene y todas esas*

cosas pero en precio la municipal es mucho más accesible (from Interview, SL08062, HG001).

Translation: The city market has advantages but it's more dangerous. In price, there are many advantages but also it takes more effort because you have to know where to look (in between food stalls) to shop because the prices vary (between the stalls) because when you go shopping and you buy a lot it's more difficult... people generally walk when they buy a few things, they walk to the city market because there are advantages. In the supermarkets, there is better quality, and cleanliness, and all those things, but the price in the city market is more accessible.

Sl08014, HG001: La diferencia entre el mercado municipal y el supermercado... La diferencia está en que los súper mercados uno va y entra en una limpieza tal y da gusto estar y uno toca la mercadería y no tiene problema. ... Porque en el mercado cualquiera te puede joder y cuando estas sacando dinero te pueden robar la billetera.

Translation: The difference between the city market and the supermarkets is the fact that supermarkets, you go in and enter such a clean (place) and it gives you pleasure to be there. And, you can touch the merchandize, there's no problem! ... Because in the city market, anybody can fuck with you and when you take out your money, they can rob your wallet.

Between the supermarkets, residents view the stores differently. Aside from cleanliness, air conditioning influences the decision to use one supermarket over another. One quote succinctly explains the difference.

Me voy al súper. Me voy algunas veces en E en S en M así... Cuando hace calor ya no me quiero ir a M, ya no me voy porque hace calor. Así me voy en E o en S y ahí aire pues y es fresquito (from Interview, SL08066, HG001).

Translation: I go to the supermarket. Sometimes I go to supermarket E, supermarket S, or supermarket M... when it's hot, I don't want to go to supermarket M, I don't go there because it's too hot inside. So, I go to supermarket E or S and they have air conditioning and its cooler.

Finally, there is some incidence of households shopping outside of San Lorenzo in another town. Here, residents leave the food environment in search for a better quality environment. The residents are in the highest income quartile and have a personal car to use to the surrounding towns. Participant, SL08041, HG001: *Es más económico, allá nos íbamos al [supermarkets outside of town].* Translation: It's more economical there.

Another participant, SL08043, HG001 stated that they leave town to access more varieties of organic vegetables: *son verduras orgánicas que suelen cultivar los seminaristas… A mí personalmente no me gusta el tomate no es bien rojo no tiene buena calidad.*

Translation: There are more organic vegetables that the seminaries grow… To me personally, I don't like a tomato that is not a good, red, and doesn't have good quality.

Summary of Findings

The majority of the sample (63%) shop at the supermarket and more than 80% of households choose to shop downtown at either a supermarket or the open air market (see Table 4.14). Food decision makers based their shopping decisions upon the kinds of food varieties and their price and location (closer or near-by) to resident's home or business, and whether they are shopping alone or with family members. In addition, residents mentioned other types of descriptions that relate to one source being "safer" (less likely to be robbed) and cleaner, or reasons relate to informal relationships and regular interactions with store managers, employees, or owners (e.g., trustworthy or known to the household). The *despensa* owner sub-population in my sample comprises half of the population that shops at the open air market.

Table 4.14

Type of Primary Food Store for Households

Store Type	N	%
Supermarket	43	63.2
Convenience Store	13	19.1
Open Air Market	12	17.6
Total	68	100

Hypothesis 2.a: Residents will identify poor access to transportation as a key factor in their decision to shop at a store

Based upon the findings in the salience tests on city advantages and disadvantages and the content relating to transportation, I find that access to transportation is an issue. However, a more accurate observation is that those residents perceive their access as unsafe and insecure. Generally, the household food decision maker finds San Lorenzo to be a nice place to live; however, the environment is contested. And, residents clearly contrast in the *barrio* on topics of city access. This is most likely due to the fact that some residents live in *villas* and find it difficult to find work and resources needed each day; whereas, other residents live in more secure housing and have more reliable modes of transportation. Regardless, most residents find it difficult to get downtown because drivers on the main roads do not 'respect' motorcyclists and walkers. Therefore, residents must change their route from a more direct line into the city to a less direct, longer, and more meandering route through other *barrios* to prevent street accidents.

Hypothesis 2.b: Residents will identify access to store credit as a key factor in their decision to shop at a store, and the lowest income residents will utilize store credit services when shopping for food

I find an overwhelming consensus in the interpretation of store codes that the *despensas* are the stores that offer credit, and that the residents who primarily use *despensas* are the most impoverished in the *barrio*. Similar to other studies (Graham, Kaufman, Novoa, & Karpati, 2006; Kaufman & Karpati, 2007), I find that the ability to access store credit requires building up cultural capital with the *despensa* owner over a long period of time. Although the prices may be a little higher at the *despensas*, the ability to buy now and save for later enables the poorest residents to prioritize their budgets while sustaining household food supplies.

The words '*dar libreta*' translates as 'giving' a resident the option to buy on store credit. This gift requires *confianza* or trust between the store shopper and the owner, which can only be established with many regular interactions. *Libreta* traditionally translates as a small book or ledger; but, here in this case I find that the word *libre* (free) is more accurate to interpret the process of '*dar libreta*.' The gift to use the store's *libreta* liberates residents from the economic barriers associated with the food desert for the short term (a week or month). For many *libreta* users, they understand the importance of maintaining trust with the owner and they understand that from their *despensa* use, the owners can keep their shops open. Therefore, they pay on time and they remain candid with their owners about their current income earnings and challenges.

Hypothesis 2.c: Personal barriers will emerge from interpretation of household shopping strategies.

I did not find that 'personal barriers' emerged from interpretations; instead, I find that lack of security and safety emerges from the shopping strategies. Whether or not crime exists downtown, residents perceive shopping downtown as a stressful and dangerous place to shop. The perceptions are strikingly contrasting when residents describe their shopping 'experience' between these two stores. For some, shopping at the supermarket is a lovely experience because it's clean and air conditioned. Shopping at the market is hot, cluttered, and unsafe. Even transportation to the downtown district is a stressful and dangerous experience (H2.a). Residents perceive that their safety risk increases if residents shop at the open air market; so, many residents will select the supermarket downtown even though the open air market is more economical. And, the majority of the sample (63%) will select to shop at the supermarket over any other source because the perception that supermarkets are more economical and safer is a highly salient rationale. At the supermarket, residents buy bulk food items; and, from those bulk items residents can prepare *seco* (dry) and *caldo* (wet) meals. Thus, the *Rio Barrio* residents appear to manage barriers through household behaviors rather than create them.

Chapter 5

MODELS OF NUTRITIONAL RISK: DIET IN THE FOOD DESERT

This chapter addresses the potential risk food deserts pose in shaping local nutritional health in San Lorenzo. I provide the evidence that exists to explain individual dietary patterns associated with residents in poor food environments. I describe the most frequently consumed foods. And, I explain the variation in dietary consumption patterns between the sample sub-groupings (e.g., comparisons between children versus adults or men versus women). In the final analysis, I model three major assumptions about the ways in which the food environment influences household consumption patterns. The results of the model verify a food desert exists; however, it demonstrates that residents in Paraguay differ in their behaviors from those studies described in the Global North. I provide evidence that, in Paraguay, local diets and household strategies appear to transform over time as a result of increased exposure to food deserts.

An undisputed and valid indicator of actual food selection and dietary consumption has been individual food preference (Logue, 1986; Pilgrim, 1961; Ruel, 2003; Schutz, 1957). More recently, researchers theorize that in food stores the availability, affordability, and quality of food stuffs are valid indicators of actual food selection and dietary consumption (Cummins, 2003; Cummins, Petticrew, Higgins, Findlay, & Sparks, 2005; Feng, Glass, Curriero, Stewart, & Schwartz, 2010). Much of the food environment literature identifies the varieties of food available to local residents and assumes a relationship between available foods and obesity (Ford & Dzewaltowski, 2008; Freedman, 2009; Inagami, Cohen, Finch, & Asch, 2006); and yet, very few studies draw a statistical link between exposure to food environments and actual residential behavior in a poor or deprived food environment (see Cummins & Macintyre, 2006).

The presence of a food store facilitates the purchase and consumption of healthy food groups if healthy food varieties are available and affordable (Inagami, Cohen, Finch, & Asch, 2006; Zenk, Lachance, et al., 2009). When residents live in a food desert, the available food varieties are mostly unhealthy (obesogenic), expensive, or completely missing from residential neighborhoods. Consequently, obesity rates increase from high consumption of obesogenic foods; also, obesity rates increase with reduced dietary variety. When both are present, they present the double burden of malnutrition and obesity. A mediating feature in the food desert discussion occurs when residents have the means to travel outside of the food desert boundaries and into more nutrient-rich and affordable food environments (Inagami, Cohen, Brown, & Asch, 2009; Rundle, Neckerman, et al., 2009). Thus, the mediating factor occurs only if the transportation allows the resident to access affordable, healthy foods often situated outside of the residential neighborhood boundaries.

Exposure to food deserts amplifies individual risk factors for obesity through various kinds of dietary and purchasing behaviors (Winkler, Turrell, & Patterson, 2006; Wrigley, 2002; Wrigley, et al., 2003). In Latin America, residents consume a diet with a high concentration of carbohydrates as well as a diet containing a large variety of carbohydrates, which are often in the form of energy-dense (high calorie) foods and beverages (Popkin, 1994, 2006, 2011). Recent studies suggest that social and economic factors in food access can impact access to both the assortment of foods available (dietary diversity) and nutritional quality of those foods (Savy, et al., 2007). The studies include information on how households cope with poor food access and price fluctuations to improve dietary consumption of more food varieties (D'Souza & Jolliffe, 2012; Oldewage-Theron & Kruger, 2011). This chapter provides a case example linking dietary intake and household strategies with residential exposure to one food desert in Paraguay.

Food Deserts, Dietary Diversity, and Obesity Risk

Generally, researchers compare types of food stores between higher income neighborhoods and more income deprived neighborhoods to evaluate variations in food environment access and residential dietary decisions and consumption. Thus, researchers compare differences in local dietary patterns between nutrient-rich sites and nutrient-poor sites to expose obesity risk among the poorest residents. The nutrient-poor sites might be classified as food deserts, but most authors did not define them as such. Researchers of the food environment focus primarily on fruit and vegetable intake for two reasons. First, because fruits and vegetables are, most often, the food items missing from stores, and, second, they are considered foods that reduce obesity incidence rates (Beaulac, Kristjansson, & Cummins, 2009; Inagami, Cohen, Finch, & Asch, 2006; Macintyre, Macdonald, & Ellaway, 2008). All the studies that expose a direct link between dietary patterns and food provisioning decisions (shopping strategies) to obesity incidence are US-based.

A review of the literature suggests that supermarkets facilitate the distribution of fruits and vegetables to residential neighborhoods (Bertrand, Therien, & Bloutier, 2008; Cummins, et al., 2009; Zenk, Schulz, et al., 2009). Specifically, one study found that income alone fails to increase the likelihood of fruit and vegetable consumption in residents; whereas, shopping at a supermarket did improve fruit and vegetable consumption (Zenk, Schultz, et al., 2005). Other studies find that residents with the means to travel to a supermarket via a personal vehicle increase their consumption of fruits and vegetables (Michimi & Wimberly, 2010; Moore, Roux, Nettleton, & Jacobs, 2008; Zenk, Lachance, Mentz, Kannan, & Ridella, 2009). Additionally, residents that live closer (within walking distance) to a large grocery store or supermarket consume more fruit and vegetables than residents that live farther away or must make multiple trips to the store (Michimi & Wimberly, 2010; Zenk, Lachance, Mentz, Kannan, & Ridella, 2009).

A remarkable, US-based study examined the premise that changes in the food environment changed dietary consumption patterns over time (Wang, Cubbin, Ahn, & Wikleby, 2007). Over 10 year period, doughnut shops, fast food restaurants, and convenience stores developed near a lower income neighborhood. Researchers examined the changes over time by administering a food frequency survey to local residents. Researchers found an inverse relationship with fast food and dietary patterns; so, even though fast food increased in the neighborhood, the consumption of fast food meals in residents did not (Wang, Cubbin, Ahn, & Wikleby, 2007). The consumption of sweets and salty snacks from convenience stores, however, did increase local BMI over time suggesting that people select to snack more often than consume fast food (Wang, Cubbin, Ahn, & Winkleby, 2007).

Snacks that are high in energy (calories) and salt contribute to increased obesity rates, particularly in adolescents and children (Farley, Baker, Futrell, & Rice, 2010; Gregori, Foltran, Ghidina, & Berchialla, 2011). People who consume more energy-containing beverages with their meals, or as snacks increase their risk for obesity (Hearst, Pasch, & Laska, 2012; Marshall, Eichenberger, Broffitt, Stumbo, & Levy, 2005); however, snacking during times of food scarcity reduces obesity risk because snacks offer nutrients missed from infrequency in meal consumption (Keast, Nicklas, & O'Neil, 2010; Macdiarmid, et al., 2009). Thus, the difference between snacks as health positive versus health negative behaviors depend on the overall total daily intake of various meals, carbohydrates, and beverages as well as the intake of fruits and vegetables (Gregori, Foltran, Ghidina, & Berchialla, 2011; Marshall, Eichenberger, Broffitt, Stumbo, & Levy, 2005; Palmer, Capra, & Baines, 2011; Popkin & Duffey, 2010; Sebastian, Cleveland, & Goldman, 2008).

In the Global South, residents may consume both a high concentration and large variety of carbohydrates and energy-dense foods and beverages (Popkin, 1994, 2006, 2011). Recent studies suggest that variation in dietary diversity and nutritional quality relates to social and economic factors in food access (Savy, et al., 2007), including how households cope with poor food access and price fluctuations in an attempt to improve dietary consumption of more food varieties (D'Souza & Jolliffe, 2012; Oldewage-Theron & Kruger, 2011). Case examples from cities in Africa (Foster, et al., 2005), the Middle East (D'Souza & Jolliffe, 2012), and South America (Savy, et al., 2007) find that higher levels of education predict better diets more than any other socio-economic factor. Following is a case study from a country (Paraguay) in the Global South that links dietary intake and household strategies with residential exposure to poor quality food environment (e.g., food desert).

In this case study located in *Rio Barrio* of San Lorenzo, Paraguay, I draw observations from an individual resident sample and a subsample of household food decision makers. I explore the dietary patterns of 126 individuals that reside in the food desert. The individual sample compiles multiple household members from within the 68 households recruited for the study. I draw upon a sample of 17 food stores to integrate their store rankings with household consumption patterns and obesity risk. I examine the health outcomes of the household food preparer as a proxy for the overall health of the family in a household regression model. Drawing upon the literature concerning relationships between dietary variety and obesity risk among food desert residents, the study hypotheses are listed below.

Table 5.1

Hypotheses: Interaction of Food Desert and Residential Access/Strategies with Health Concerns

3.a Households with lower incomes are more likely to consume less varieties of fruits and vegetables
3.b Households with access to personal vehicles are likely to have increased dietary variety, particularly are likely to consume more varieties of fruits and vegetables
3.c Households that shop at supermarkets are likely to consume more fruits and vegetables and have a lower BMI overall

San Lorenzo Population Sample

I sampled 126 residents in this study, which exceeds the required sample size of 110. I counted 332 individuals in the recruited households, so 206 individuals are “missing” from data collection. Table 5.2 displays the frequency of reasons people were not included in the study. The majority of the “missing” population (44%) was not present because of their occupation status or because they were in school.

Table 5.2

Frequency of Consented Participants and Non-consented

Consented or Reason Not Included	N	Percent
Consented & Participated	126	38
No Consent in Study	22	6.6
Not Present During Interview	145	43.7
Not in Age Appropriate Range	35	10.5
Has Special Needs	3	0.9
Consented But Dropped Out of Study	1	0.3
Total	332	100

At the time of the scheduled interview, 126 residents agreed to participate while 145 residents were not present and 23 chose not to participate. I excluded the remaining individuals, per my agreement with IRB, due to their age (most were too young) or health status (some had special needs and required assistance that I could not provide). The individual response rate is 82.5%.

The 126 individuals in the sample group into four major categories (see Table 5.3). I classified ages under 18 years as children (N=27, 22%) versus ages 18 years older as adults (N=94, 78%). Women dominate the gender category in my sample statistics (Table 5.4). Close to 82% of the adult population include women, and over half of the child population includes females. Proportionately, I find more male children (39%) than male adults (17%); so, I categorized gender by their age groupings (see Table 5.4).

From the household rosters, I learned that the average household size is 4.88 individuals. I matched household ID codes with their household size for each individual and created a new binary variable for household size with the cut-off for the two groups at 4: smaller households contained 4 individuals or less while larger households contained more than 4 individuals (see Table 5.3). Then, I investigated if individuals from smaller households shared similar dietary patterns versus individuals from larger households.

I also examined the level of educational attainment (primary school, secondary school, and technical or university degree) among the individual sample, and I further classify education by age groups (see Table 5.5). Everyone in my sample had some level of education. Educational attainment for adults becomes a proxy for SES (Savy, et al., 2007). The majority of the adult population attained some level of primary school (40%) or secondary school (43%); yet, only a small number (17%) attend or have attended a technical or university degree.

Table 5.3

Sample Descriptive by Grouping Variable

Variable	Groups	N	%
Age	Child (under 18 years)	27	22.3
	Adult (18 years and older)	94	77.7
Gender	Male	28	23.1
	Female	93	76.9
Household Size	Small (4 members or less)	59	48.8
	Large (more than 4 members)	62	51.2
Educational Attainment	Primary School	52	43
	Secondary School	53	43.8
	Technical or University Degree	16	13.2

Table 5.4

Gender by Age Groupings

Independent Variable		Age Child	Adult	Total
Male	N Count	11	17	28
	% Gender	39.3%	60.7%	100.0%
	% Age	40.7%	18.1%	23.1%
Female	N Count	16	77	93
	% Gender	17.2%	82.8%	100.0%
	% Age	59.3%	81.9%	76.9%
Total	N Count	27	94	121
	% Gender	22.3%	77.7%	100.0%
	% Age	100.0%	100.0%	100.0%

Table 5.5

Educational Attainment by Age Groupings

Education Level		Age		Total
		Child	Adult	
Primary School	N Count	14	38	52
	% Education Level	26.9%	73.1%	100.0%
	% Age	51.9%	40.4%	43.0%
Secondary School	N Count	13	40	53
	% Education Level	24.5%	75.5%	100.0%
	% Age	48.1%	42.6%	43.8%
Technical or University Degree	N Count	0	16	16
	% Education Level	0.0%	100.0%	100.0%
	% Age	0.0%	17.0%	13.2%
Total	N Count	27	94	121
	% Education Level	22.3%	77.7%	100.0%
	% Age	100.0%	100.0%	100.0%

Since the demographics of the “missing” population are known, I have a strong bias towards women, younger children, and adults over the age of 30 in my sample; however, levels of educational attainment lack statistical differences between the “missing” population and the recruited sample (p=0.924, see Appendix E, Tables E.1a-1b). Thus, the results relating to education may be used to explicate hypotheses for the general population even though my sample is predominately adult females and younger children.

The Common Diet

The individual sample consumes a mean of 72% of the food items in the food frequency survey (minimum overall= 26%; maximum overall=98%). Table 5.6 provides the descriptive results of the dietary variety food groups (see Appendix E, Table E.2 for the complete frequency table for each food item by their food grouping). On average, the sample consumes a wider range of energy-containing beverages, fruits and vegetables, and various kinds of lunch and dinner entrees.

Table 5.6

Descriptive Statistics of Dietary Variety Scale by Food Groups

Food Group	Min	Max	Mean	Std. Dev.
Condiments	0.286	1.000	0.613	0.147
Dairy	0.000	1.000	0.570	0.497
Energy-containing Beverages	0.200	1.000	0.856	0.151
Fruit and Vegetables	0.250	1.000	0.782	0.176
Lunch and Dinner Entrees	0.154	1.000	0.774	0.186
Sweets, Snacks, and Carbohydrates	0.083	1.000	0.656	0.197

Condiments. Every day, Paraguayans use sugar (96%), salt (84%), butter or oil (92%) to season, cook, and sweeten their food.

Residents use sugar to sweeten tereré, mate, and coffee. Some residents use a sugar-free substitute (about 20%) because they are diabetic or concerned with developing diabetes. Salt is used daily, and many foods are salted to preserve food quality. Residents will salt lettuce after it is cut to keep it fresh and from wilting. Also, residents use a salt rub to flavor and tenderize their meat. Another major condiment is mayonnaise which people use to prepare potato or rice salads; residents consume mayonnaise on a weekly basis (42%) more often than a daily basis (13%). Ketchup is used occasionally with hot dogs, hamburgers, or other snack food types; however, 60% of the sample said they never use ketchup.

Dairy. In Paraguay, milk is in abundance. It is not uncommon for residents to travel into the rural communities to visit their neighbors and to bring back jugs of fresh farm milk. In the city, as well, NEMS-S found that milk is in almost every store; however, most of the milk in the neighborhood is not low-fat; and downtown, most low-fat milk is more expensive than regular milk. For the purpose of nutritional food classification, I consider milk as an energy-containing beverage and classified yogurt as a dairy product (McCrory, et al., 1999). In Paraguay, yogurt is most commonly a breakfast food particularly when residents need to eat something quickly or in transit to school or work; however, 43% of the sample did not consume yogurt.

Energy-containing Beverages. The most frequently consumed beverage is milk (90% consume milk daily). The second most frequently consumed beverage is tereré or mate (79% consume daily). Tereré and mate are common teas made from the same native plants. Tereré is the cold variety of the tea, and mate is the hot variety. Cocido uses the same plants as tereré and mate, but it is a hot beverage where refined sugar is burnt with the plant leaves to crystalize the herb before steeping it in hot water, thereby giving it a different flavor; some residents also add warm milk to cocido to sweeten and thicken the beverage. About 65% of the sample consumed cocido on a daily basis.

Over half (54%) of the sample consume juice on a daily basis. Sugar, again, is used to sweeten the juice, and most juice is made at home with a citrus fruit. Sometimes, residents put chunks of fruit in the juice, so after you consume the beverage, you can eat the fruit. However, this type of a fruit cocktail is more common downtown and sold in cups along the bus line (see Figure 5.1). The least frequently consumed beverage is soda. Thirty-two percent of the population does consume soda every day, while 34% consume soda on a weekly basis. Diet soda doesn’t exist in the neighborhood and is hard to find in the supermarkets.

Figure 5.1. Photo of a woman selling fruit juice by the cup downtown at a major bus crossing

Fruit and Vegetables. The key vegetables necessary to prepare traditional, household dinner entrees include green pepper, onion, and tomatoes. I find that the sample consumes tomatoes (94%), onions (89%), and green peppers (74%) daily. Some participants stated that they preferred not to use green peppers in their meals because they add too much spice. Lettuce salads (42%), squash (44%), and other kinds of vegetables (48%) are consumed on a weekly basis. Fruit consumption varies; 48% of the sample consumes fruit each day, while 28% consume some kind of fruit during the week.

Lunch and Dinner Entrees. Most of the Paraguayan meals are cooked in oil and many of the meals are fried. Regarding protein, on a daily basis, residents consume beef more often (65%) than chicken (9%). Generally, beef or chicken are prepared in a tomato sauce and served over white rice or pasta (*arroz* or *fideo*). Eggs are more commonly eaten during the week (53%) versus the day (12%); and, residents consider eggs as a type of protein topping for a meal. For example, when other cultures add cheese to a sandwich or hamburger, Paraguayans add an egg in place of the cheese. Other entrees, hamburgers, empanadas, fried croquettes, hot dogs, *milanesa* (fried beef or chicken steak), *poroto* (black bean soup cooked with cheese), *asado* (barbeque beef ribs), and sausages are frequently consumed on a weekly to monthly basis. Most of these meals are high in carbohydrates, salt, and saturated fat.

Sweets, Snacks, and Carbohydrates. The majority of the sample (90%) consumes white bread each day as well as other types of carbohydrates: potatoes (42%), manioc (41%), or rice (39%). Weekly, participants consume these common carbohydrates with high frequency as well. Another common, weekly carbohydrate that participants consume is the Paraguayan tortillas (56%), which involve frying dough in a flour and egg batter. Paraguayans also consume mayonnaise-based, rice or potato salads each week (49%); usually, carrots are added to sweeten the salad and/or green peppers are added to spice the salad. Sopa Paraguaya (corn bread baked with cheese, anise, and milk) is a traditional food most often consumed on a monthly basis (41%). Sopa Paraguaya is usually served to complement a special meal, like for a birthday, holiday, or baptism. On a day to day basis, sopa Paraguay is sold in stores as prepared food or served at restaurants and smaller food stands as a side dish.

Dietary Variation

In a series of Independent T-tests, I examine the internal variation in the frequency of food intake between groups of individuals within the total sample.

Age Comparisons. Between the age groups, children consume a wider variety of meals than the adults. These meals include asado ($t(44)=2.852$, $p=0.007$), rice or pasta based meals ($t(45)=2.096$, $p=0.042$), beef ($t(81)=2.970$, $p=0.000$), and hamburgers ($t(36)=3.376$, $p=0.002$). Children also consume cake ($t(38)=2.471$, $p=0.018$), soda ($t(53)=4.925$, $p=0.000$), and ketchup ($t(41)=2.197$, $p=0.034$) more often than adults. Adults consume squash ($t(41)=2.409$, $p=0.021$), lettuce salads ($t(40)=3.094$, $p-0.004$), tereré or mate ($t=3.525$, $p=0.001$), and sugar substitutes ($t(82)=2.950$, $p=0.004$) more often than the children sample (see Appendix E, Table E.3 for the complete summary of results).

Gender Comparisons. Between gender categories in the total sample, I find some variation exists for chicken ($F=7.560$, $p=0.007$), green peppers ($F=5.113$, $p=0.26$), vori vori soup ($F=4.157$, $p=0.044$), French fries ($F=6.062$, $p=0.015$), oil and butter ($F=7.576$, $p=0.007$), and ketchup ($F=4.090$, $p=0.045$); however, the only significant measure in a t-test between gender found ketchup as predominately consumed by men (t(39)=3.356, p=0.002). See Appendix E, Table E.4 for the complete summary of results.

I found no significance difference between male and female children; except, boys eat hot dogs more frequently than girls (t(25)=2.628, p=0.014). No other food item provided a statistical significance (Appendix E, Table E.5). The adult men, however, consume white bread (t(76)=2.563, p=0.012), green peppers (t(62)=2.994, p=0.004), ketchup (t(21)=2.366, p=0.028), and tereré or mate (t(76)=3.183, p=0.012) more often than adult women; however, women appear to eat pizza (t(25)=2.087, p=0.047) more often than adult men (Appendix E, Table E.6).

Household Size Comparisons. I find that smaller households consume more lettuce salads (t(118)=2.309, p=0.024), salt (t(61)=2.313, p=0.024), and ketchup (t(110)=2.296, p=0.024). Larger households consume cocido (t(105)=2.425, p=0.017), rice (t(93)=3.415, p=0.001) and rice or pasta-based meals (t(114)=2.079, p=0.017), and more variety of soups, vori vori (t(114)=2.227, p-0.028) and poroto (t(110)=2.113, p=0.037) more often than smaller households (see Appendix E, Table E.7 for the complete summary of results).

Educational Attainment Comparisons. Among the three groups of education, I find that people with primary school education consume poroto (F(2, 118)=6.186, p=0.003) and manioc (F(2, 118)=3.889, p=0.023) more than people with higher levels of education (Appendix E, Table E.8a-8b). Again, I explored the adult versus the child population. I find a wide variation among children in the sample on multiple food items (e.g., green peppers, tomatoes, other kinds of vegetables, cocido, soda, hot dogs, and fruit salad), but I did not find any statistical significance among the groups. The findings suggest some children may prefer certain food items over others more often, but the meals children consume are relatively the same (Appendix E, Table E.9).

In an ANOVA and Bonferroni post-hoc test for adults and between the three groups (Appendix E, Table E.10a-10b), I find that adults with some form of primary education consume more onions (F(2, 91=3.302, p=0.041), manioc (F(2,91)=3.245, p=0.044), and poroto (F(2, 91)=6.249, p=0.003). Among varying levels of education, people with primary levels of education consume more manioc (p=0.043) and poroto (p=0.002) than people with a secondary level of education.

Dietary Consumption and Obesity Risk

The average BMI for the total sample is 25.67 (minimum value=14.77, maximum value=43.81, standard deviation=6.41), so the sample BMI average classifies as overweight. Table 5.7 provides the BMI classified categories for the sample. Table 5.8 shows the frequency (N) of BMI category by age and gender.

Table 5.7

Frequency of BMI Categories for the Total Sample

BMI Category	N	Percent
Under to Normal Weight	35	27.78
Overweight	35	27.78
Obese	56	44.44
Total	126	100

Table 5.8

Cross-tabulation of BMI by Age and Gender

BMI Category	Age (N)		Gender (N)	
	Child	Adult	Male	Female
Under to Normal Weight	6	29	6	29
Overweight	7	28	10	25
Obese	18	38	15	41
Total	31	95	31	95

People who eat more fruits and vegetables are less likely to be overweight or obese, and people who consume more varieties of sweets, snacks and carbohydrates are more likely to be overweight or obese. People who consume more energy-containing beverages in combination with other food varieties are more likely to be overweight or obese. In an ordinal logistic regression test, I tested BMI as the dependent variable against three dietary predictors: (1) sweets, snacks, and carbohydrates, (2) fruits and vegetables, and (3) energy-containing beverages; and I found no significance (see Appendix E, Tables E.11a-11b).

Nutritional Risk in the Food Desert: A Household Model

The primary unit of analysis in this model of nutritional risk is the household (N=68), as characterized by the data derived from the household food decision maker. The average (mean) BMI for the sample is 28, classified as overweight (minimum=17.66; maximum =43.81, standard deviation=5.999). Table 5.9 displays the BMI categories for each household participant. Only one household food decision maker is underweight; the household is a newer resident (4 years living in the neighborhood), and in the lowest household income quartile. The overall dietary consumption for the underweight participant is 0.435, which is far below the mean (see Table 5.10).

Table 5.9

Frequency of BMI Categories for the Household Food Decision Maker

BMI Category	N	Percent
Under to Normal Weight	23	33.8
Overweight	18	26.5
Obese	27	39.7
Total	68	100

Table 5.10

Descriptive Statistics of Dietary Variety Scale by Food Groups for the Household Food Decision Maker (N=68)

Food Group	Min	Max	Mean	Std. Dev.
Condiments	0.286	0.857	0.595	0.145
Dairy	0.000	1.000	0.515	0.503
Energy-containing Beverages	0.200	1.000	0.856	0.150
Fruit and Vegetables	0.250	1.000	0.798	0.178
Lunch and Dinner Entrees	0.154	1.000	0.771	0.190
Sweets, Snacks, and Carbohydrates	0.083	0.917	0.645	0.188
Total Dietary Variety	0.261	0.913	0.720	0.131

Hypothesis 3.a: Households with lower incomes are more likely to consume fewer varieties of fruits and vegetables. In an Independent t-test, I grouped households by their accumulated income with a cut-off point at the sample mean= 2,765,826 *Guaranies* (approximately 570 USD during data collection months). Twenty-six households classify as lower income, while 42 households classify as higher; only 17 of those 42 classify in the highest quartile (equal to or greater than 3,593,750 *Guaranies*, approximately 740 USD a month). No t-values returned statistical significance (see Appendix E, Table E.12). Household income is not a predictor of increased dietary variety of fruits and vegetables.

Hypothesis 3.b: Households with access to personal vehicles are likely to have increased dietary variety, particularly are likely to consume more varieties of fruits and vegetables. I selected for households that own a personal vehicle to transport their groceries from store to home. Half of the household sample owns some kind of transport, either a motorbike, car, or both (see Table 5.11).

Table 5.11

Frequency of Vehicle Ownership for Households

Vehicle Type	Frequency	Percent
No Household Vehicle	34	50
Motorbikes Only	16	23.5
Car Only	12	17.6
Both Motorbike and Car	6	8.8
Total	68	100

Table 5.12

Analysis of Variance between Households, Vehicle Use, and Diet

		Sum of Squares	df	Mean Square	F (Sig.)
Total Dietary Variety	Between Groups	0.038	2	0.019	1.122 (0.332)
	Within Groups	1.113	65	0.017	
	Total	1.151	67		
Condiment	Between Groups	0.038	2	0.019	0.897 (0.412)
	Within Groups	1.375	65	0.021	
	Total	1.413	67		
Dairy	Between Groups	1.701	2	0.851	**3.618 (0.032)**
	Within Groups	15.28	65	0.235	
	Total	16.99	67		
Energy-Containing Beverages	Between Groups	0.041	2	0.02	0.905 (0.410)
	Within Groups	1.467	65	0.023	
	Total	1.508	67		
Lunch and Dinner Entrees	Between Groups	0.091	2	0.045	1.271 (0.287)
	Within Groups	2.323	65	0.036	
	Total	2.414	67		
Sweets, Snacks, & Carbohydrate	Between Groups	0.132	2	0.066	1.922 (0.155)
	Within Groups	2.237	65	0.034	
	Total	2.37	67		
Fruits and Vegetables	Between Groups	0.041	2	0.02	0.635 (0.533)
	Within Groups	2.085	65	0.032	
	Total	2.126	67		

I grouped households in three ways: (1) Households without a vehicle; (2) Households with a motorbike; (3) Households with a car, including 6 households with a motorbike and a car. In an analysis of variance (ANOVA) and a Bonferroni post-hoc test, I compared total dietary variety between these three groups. Results confirm that having a vehicle improves the consumption of healthier food groups, but dairy was the only significant group and not fruits and vegetables (see Table 5.12).

Owning a car or some combination of motor vehicles, in particular, improves dairy consumption (p=0.04; see Table 5.13).

Table 5.13

Post-hoc Bonferroni Comparisons between Households Groups by Vehicle Access

Dependent Variable	(J) Vehicle	Mean Dif. (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Total Dietary Variety	motorbike	-0.059	0.040	0.42	-0.157	0.038
	car	-0.021	0.038	1.00	-0.115	0.073
Condiment	motorbike	-0.054	0.044	0.69	-0.162	0.055
	car	-0.040	0.042	1.00	-0.144	0.064
Dairy	motorbike	-0.026	0.147	1.00	-0.387	0.336
	Car	**-0.366**	0.141	**0.04**	-0.713	-0.019
Energy-Containing Beverages	motorbike	-0.059	0.046	0.60	-0.171	0.053
	car	-0.003	0.044	1.00	-0.111	0.104
Lunch and Dinner Entrees	motorbike	-0.090	0.057	0.36	-0.231	0.051
	car	-0.014	0.055	1.00	-0.150	0.121
Sweets, Snacks,& Carbohydrate	motorbike	-0.101	0.056	0.23	-0.240	0.037
	car	0.007	0.054	1.00	-0.126	0.140
Fruits and Vegetables	motorbike	0.044	0.054	1.00	-0.090	0.177
	car	-0.025	0.052	1.00	-0.153	0.103

Hypothesis 3.c: Households that shop at supermarkets are likely to consume more fruits and vegetables and have a lower BMI overall. For this hypothesis, I ran two statistical tests. First, I ran an Independent T-test to examine the comparison of total dietary variety between households that shop at a supermarket (N=43) and households who shop at the municipal market or at smaller stores (N=25). The group

descriptive statistics are shown in Table 5.14. The results reveal that the variance between the dietary scales are more significant than the actual comparisons between the means (see Appendix E, Table E.13); and, households who shop at a supermarket do consume a widespread variation in total dietary variety (F=5.072, p=0.028), but shopping at a supermarket does not ensure that people will consume more fruits and vegetables (t(46)=-0.096, p=0.924). Instead, I find that households shopping at a supermarket are more likely to consume a wider variety of lunch and dinner entrees (F=10.984, p=0.001).

Table 5.14

Group Statistics by Selecting to Shop at a Supermarket versus Other Store

Food Variety	Shops at Supermarket			Shops other Store		
	Mean	Std. Dev.	Std. Error Mean	Mean	Std. Dev.	Std. Error Mean
Total Dietary Variety	0.731	0.106	0.016	0.701	0.167	0.033
Condiment	0.618	0.127	0.019	0.554	0.167	0.033
Dairy	0.535	0.505	0.077	0.48	0.51	0.102
Energy-Containing Beverages	0.851	0.132	0.02	0.864	0.18	0.036
Lunch and Dinner Entrees	0.794	0.141	0.022	0.732	0.251	0.05
Sweets, Snacks, and Carbohydrates	0.647	0.173	0.026	0.64	0.215	0.043
Fruits and Vegetables	0.799	0.175	0.027	0.795	0.187	0.037

Next, I examined if shopping at a supermarket decreases the incidence of overweight and obesity (BMI) of the household food preparer in a linear regression test. I coded households that shopped at a supermarket versus households that shopped at another food store, and I found no significance (see Table 5.15).

Table 5.15

Linear Regression Model: Predictor of BMI by shopping at a supermarket

Model Summary	R	R^2	Adjusted R^2	Std. Error of the Estimate
Predictor: Shops at Supermarket	0.068	0.005	-0.01	6.03127
ANOVA	Sum of Squares	df	Mean Square	F (Sig.)
Regression	11.132	1	11.132	0.306 (0.582)
Residual	2400.83	66	36.376	
Total	2411.96	67		
	Unstandardized		Standardized	
Coefficients	B	Std. Error	Beta	t (Sig.)
(Constant)	27.496	1.206		22.794 (0.000)
Shops at a Supermarket	0.839	1.517	0.068	0.553 (0.582)

I modified the hypothesis to examine if the store rankings rather than the type of store may be a better fit for a model of obesity risk. I examine the following question: if the food source is poor, then does the decision to shop at a poorly ranked store promote a higher BMI? In this case, I didn't select for specific households; rather I weighted the regression models to minimize errors in population estimates with a number of household characteristics: household size, income, level of food security, and years in current residence.

The regression results predict that shopping at a store with wider varieties of food available will increase the likelihood of obesity in residents (R^2=0.086, F(1, 63)=5.963, p=0.017). In the second model with two predictors, I find that the availability and affordability rank increase their likelihood of obesity (R^2=0.098, F(2, 62)=3.356, p=0.041); however, the first model (availability only) reveals a stronger relationship. Interestingly, the weighted model suggests that residents who live longer in the neighborhood (e.g., food desert) are more likely to select a closer and more convenient store with lower availability ranks (t(64)=-2.442, p=0.017) to suggest that overtime, people select to shop more conveniently than downtown at supermarkets. (See Appendix E, Tables E.14-E.15 for results from other tests.)

Table 5.16

Linear Regression Model Summary: Predictors of BMI by store ranks and weighted by years living in current residence

Model	Store Ranks	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	Availability	.294[a]	0.086	0.072	20.884
2	Affordability	.313[b]	0.098	0.069	20.922
3	Quality	.339[c]	0.115	0.071	20.891

a. Predictors: (Constant), Store Availability Rank
b. Predictors: (Constant), Store Availability Rank, Store Affordability Rank
c. Predictors: (Constant), Store Availability Rank, Store Affordability Rank, Store Quality Rank

Table 5.17

Analysis of Variance: Regression models of BMI predicted by store ranks

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2600.671	1	2600.671	**5.963**	**0.017**[a]
	Residual	27475.915	63	436.126		
	Total	30076.586	64			
2	Regression	2938.201	2	1469.100	**3.356**	**0.041**[b]
	Residual	27138.385	62	437.716		
	Total	30076.586	64			
3	Regression	3453.296	3	1151.099	2.637	0.058[c]
	Residual	26623.290	61	436.447		
	Total	30076.586	64			

a. Predictors: (Constant), Store Availability Rank
b. Predictors: (Constant), Store Availability Rank, Store Affordability Rank
c. Predictors: (Constant), Store Availability Rank, Store Affordability Rank, Store Quality Rank

Table 5.18

Table of Coefficients: Predicting BMI weighted by years in current residence

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	35.844	2.992		11.978	0.000
	Availability	-0.531	0.218	-0.294	-2.442	0.017
2	(Constant)	30.515	6.769		4.508	0.000
	Availability	-0.246	0.391	-0.136	-0.630	0.531
	Affordability	0.248	0.282	0.190	0.878	0.383
3	(Constant)	34.940	7.891		4.428	0.000
	Availability	-0.454	0.435	-0.251	-1.044	0.301
	Affordability	0.498	0.364	0.382	1.368	0.176
	Quality	-0.389	0.358	-0.322	-1.086	0.282

Table 5.19

Excluded Variables: Predicting BMI weighted by years in current residence

	Model	Beta In	t	Sig.	Partial Correlation	Tolerance
1	Affordability[a]	0.190	0.87	0.38	0.111	0.311
	Quality[a]	-0.065	-0.283	0.78	-0.036	0.275
2	Quality[b]	-0.322	-1.086	0.282	-0.138	0.165

a. Predictors in the Model: (Constant), Store Availability Rank
b. Predictors in the Model: (Constant), Store Availability Rank, Store Affordability Rank

Summary of Findings

No single food contains all the nutrients needed for sustenance. People depend on dietary variety to satisfy their nutritional needs (WHO, 1996); however, when food varieties are high in caloric content, refined sugars and carbohydrates, and saturated fats, then their dietary diversity underpins an unhealthy or obesogenic diet. In San Lorenzo, I find that diets are high in carbohydrates (staple starches and breads), refined sugars (condiments, energy-containing beverages), and caloric content meals (cake, hamburgers, hot dogs, pizza, and sopa Paraguaya). Almost every meal in Paraguay contains at least one starch; though on several occasions, I saw many meals with a combination of starches. The majority of the sample (90%) consumes white bread each day along with another type of starch: potato, manioc, or rice. Potatoes, rice, and white bread make it possible to “stretch” any meal and obtain a sense of satiety (de

Graaf, Hulshof, Weststrate, & Jas, 1992; Duncan, Bacon, & Weinsier, 1983).

Nutritionists suggest that children snack more often than adults (Birch, 1979; Desor, Green, & Maller, 1975), and regular consumption of snacks high in energy and salt contribute to obesity incidence in later adolescence (Farley, Baker, Futrell, & Rice, 2010; Gregori, Foltran, Ghidina, & Berchialla, 2011). Additionally, people use an assortment of condiments to improve food taste (Maller, Cardello, Sweeney, & Shapiro, 1982). Between groups, I find that children consume more varieties of meal and snack foods while adults consume more varieties of energy-containing beverages. Salt, sugar, mayonnaise, butter, and oil are the most common condiments consumed; ketchup is the most variable. Children eat more snacks and "handy" meals, such as hamburgers, hot dogs, manioc, and empanadas, all of which ketchup complements. These findings indicate the adoption of obesogenic food items by children.

Men often prefer spicier foods than women (Alley & Burroughs, 1991; Logue & Smith, 1986); and, I find adult men use more ketchup (including green peppers) to add flavor, which further justifies the observation that men prefer adding extra spice to foods (Alley & Burroughs, 1991).

Table 5.20

Summary Table of Significant Food Items by Population Variable; food items with reoccurring significance shown in ***bold.***

Food Variety	Age	Gender	Household Size	Education
Asado	X			
Beef	X			
Cake	X			
Cocido			X	
Green Peppers		X		
Hamburgers	X			
Hot Dogs		X		
Ketchup	**X**	**X**	**X**	
Lettuce Salad	**X**		**X**	
Manioc				X
Pizza		X		
Poroto			**X**	**X**
Rice			X	
Rice or Fideo	**X**		**X**	
Soda	X			
Squash	X			
Sugar Substitute	X			
Tereré or Mate	**X**	**X**		
Vori Vori			X	
White Bread		X		

Sweets, Snacks, and Carbohydrates

Residents that live in close proximity to stores that sell snack foods will likely increase the consumption of sweet, salty, and greasy snacks (Farley, Baker, & Rice, 2010; Thornton, Cameron, McNaughton, Worsley, & Crawford, 2012; Wang, Cubbin, Ahn, Winkleby, 2007). In the San Lorenzo neighborhood and surrounding areas, residents have access to snacks in many of the neighborhood food stores, street-side stands, and restaurants. Children are more likely to consume snack and high energy meal varieties. During survey collection, many children told me their parents give them money to purchase a snack on their way home from school.

The neighborhood school sits on a large corner that takes up an entire neighborhood block. At one point of entry to the school, a woman opens her garage door to sell home-made treats to the students as they exit school (see Figure 5.2). The treats included empanadas, ham and cheese sandwiches, and *dolce de leche* cake (a caramel-swirl, yellow cake). While I spoke with this resident, two students ran over during their recess time. One bought a piece of cake while the other bought an empanada with red meat.

Figure 5.2. Photo of a woman selling snacks and sweets by the school; photos show juice, empanadas and manioc (in the case), cake, and sandwiches.

At another point of entry to the school, a store owner opens her shop to the local school. Her store had some of the lowest variability in fresh food (see Figure 5.3). The owner told me that she had sold fresh produce in the past, but none of the students bought those foods. Because of her location to the school, most of her clientele are the school children. She explained that after school or during their recess time, they enter her store and purchase packaged snacks, bread rolls, and sodas.

Figure 5.3. Photo of the *despensa* across from the school: on the counter are various kinds of white bread rolls; the shelves contain juice boxes and various condiments; in the back are sodas; in the cooler, there was yogurt and milk; survey found no fresh produce.

Another woman, who lives between the smaller (*despensa*) store and the independent home-made baked goods and sandwich vendor, sells home-made ice cream bars. Throughout the neighborhood, residents put signs on their fences to indicate that they sell food (see Figure 5.4). During the household interview with the resident that sells ice cream, three students ran over during their recess time to purchase an ice cream bar from her. A few minutes later, two more students came over asking for ice cream, but the woman had sold out. She told me that she earns very little from her sales, but that the children come by weekly.

Figure 5.4. Photo indicating that the household sells ice and ice cream.

Most research finds that the combination of snacks with fruits and vegetables decrease obesity risk (Gregori, Foltran, Ghidina, & Berchialla, 2011; Popkin & Duffey, 2010; Sebastian, Cleveland, & Goldman, 2008). However, the results from San Lorenzo suggest that consumption of sweets, snacks, and carbohydrates are not strong predictors of obesity; and, when combined with fruits and vegetables, dietary variety increases as does obesity risk. In terms of age, obesity risk appears to occur in later adolescence and early adulthood even though children consume more obesogenic foods than adults.

Energy-containing Beverages

Beverages, like snacks, can increase the intake of macro- and micro-nutrients (Hearst, Pasch, & Laska, 2012; Marshall, Eichenberger, Broffitt, Stumbo, & Levy, 2005). In particular, juice and milk increase nutritional intakes in positive directions even when sugar gets added (Marshall, Eichenberger, Broffitt, Stumbo, & Levy, 2005). In San Lorenzo, people consume a number of beverages; most of which do not predict obesity based on the data presented in this study. Between group comparisons, I find children consume more soda than adults, and adults consume more tereré and mate, particularly male adults.

Paraguayans consider tereré and mate as an adult beverage because the *yerba mate* used to prepare the dinks contain high concentrations of caffeine. The caffeine concentrations are about three times the amount of caffeine in soda, but about half the concentration in coffee (see Heckman, Weil, and Gonzalez de Mejia, 2010). Children protest the taste and say the *yerba mate* is too bitter, which is why they select soda more often than tereré or mate. Typically, children prefer sweeter beverages over non-sweet (Conner & Booth, 1988).

Traditionally, *yerba mate* is a medicinal plant used to prevent infection and improve digestive functions (Millman, 2012; Reber, 1985). During data collection, women told me that they continue to consume tereré or mate as medicine, but not daily because they fear weight gain due to the high caloric content. A "diet" variety exists, which is about half the calories of regular varieties (Regular Variety=average 55 calories per 50 gram serving; Diet Variety= average 10 calories per 50 gram serving). The NEMS-S found the "diet" varieties are more expensive than the regular varieties. Instead of cutting the calories, women appear to cut their daily consumption. Men, on the other hand, maintain the daily custom of consumption.

The calories of either variety are not enough to increase dramatic weight gain, which is a misconception of the population. In fact, a number of chemical agents in the herb help to reduce weight gain as the consumption is increased (Andersen & Fogh, 2001). Other studies find that the leaves from yerba mate (*Ilex paraguariensis)* reduce LDL-cholesterol levels and overall obesity risk (Bracesco, Sanchez, Contreras, Menini, & Gugliucci, 2011; de Morais, et al., 2009; Kang, et al., 2012). The herbs for the beverage increase individual energy levels and improve health. Overall, the majority of energy-containing beverages consumed by the San Lorenzo sample are relatively healthy choices and do not factor into predicting obesity rates.

Restaurants

Food desert research includes snack and fast foods restaurants and stores (Cummins, McKay, & Macintyre, 2005; Macdonald, Cummins, & Macintyre, 2007; Mehta & Chang, 2008; Sharkey, Horel, Han, & Huber, 2009), particularly when the restaurants are within a walking distance (Burns & Inglis, 2007; Inagami, Cohen, Brown, & Asch, 2009), or in low income, deprived neighborhoods (Cummins, McKay, & Macintyre, 2005; Hemphill, Raine, Spence, & Smoyer-Tomic, 2008). As with food stores, fast food restaurants increase obesity risk for local consumers (Jeffery, Baxter, McGuire, & Linde, 2006; Lucan, Karpyn, & Sherman, 2010;

Maddock, 2004). In San Lorenzo, the observation that women eat pizza more often than men signals restaurant use by residents; and, the finding indicates a social experience of eating out at least once a month or once a week.

Figure 5.5. Photo of a pizza restaurant downtown; left: pizza chef heating up his brick oven; right: women sharing a pizza and beer downtown.

Pizza is almost always purchased downtown at a restaurant. Most pizza restaurants use a *tatacuá*, or a *Guarani* traditional brick oven, to prepare the pizza (see Figure 5.5). Very few residents own a gas, electric, or brick oven to cook a pizza at home, so downtown pizza restaurants are the primary point of interest for a night out on the town. A recent study finds that obesity risk factors may exist outside of the household, through community, social eating interactions among networks of social relationships (Christakis & Fowler, 2007). In this case, I find that women eat more pizza than men. The striking difference between these two groups suggests that once a month or once a week, women go downtown, either alone or to meet with other women for a social gathering around food.

Household Behavior

The results of the food frequency questionnaires highlight how individual preferences influence people's dietary intake; however, the household model of nutritional risk helps to explicate how the food environment influences household food production and consumption patterns. Current research fails to explain how food prices and availability becomes embodied in local nutritional and dietary health outcomes (Lytle, 2009). My research, on the other hand, finds that the food environment shapes individual decisions and the cultural underpinnings that help to defend their decisions. Interestingly, my results signal to two primary household strategies to increase household food security. The first involves meal composition for the week ('wet" versus "dry" meals); and, the second involves shopping strategies in the food desert.

Coping Strategies. In chapter 4, I identified a number of coping strategies that families employ. A traditional diet includes alternating "wet" versus "dry" lunch meals during the week. My findings suggest that larger households rely on the essential "wet" (poroto or vori vori) and "dry" (arroz or fideo) meals. Residents can purchase the beans and cheese needed to prepare poroto and the cornmeal needed to prepare vori vori at the open air market and in bulk (see Figure 5.6). For vori vori, residents roll corn meal into small balls and slow cook the balls in chicken broth with vegetables. For larger households with less income earnings, poroto and vori vori help residents satisfy multiple household members with a "one pot" meal.

Figure 5.6. Photo from an open air market stall; photo shows food bins for corn, beans, corn meal, and cheese (located in the metal containers in between the bulk corn meal).

Shopping Strategies. Food stores facilitate the purchase and consumption of foods in local diets. In the results from San Lorenzo, I find that the presence of a supermarket does not ensure healthy eating habits. Instead, I find that stores with higher food availability ranks, including supermarkets, the municipal market, and a few neighborhood stores, increase obesity rates for the households. This is likely due to the fact that shopping downtown increases the consumption of various kinds of lunch and dinner entrees, most of which are obesogenic. In the Global

South, residents tend to buy food items that are on sale or lower priced, which leads residents to purchase packaged or bulk food items, and/or less fresh produce at supermarkets (Hawkes, 2008).

Stores with higher affordability ranks include the local convenience stores and the open air market. In the Global South, poorer urban residents favor open air markets over supermarkets because residents can establish more direct connections with producers and vendors to create store credit lines during periods of low cash flows (Plattner, 1985; Pothukuchi & Kaufman, 1999; Pottier, 1999). Local price fluctuations and food shortages remain relatively unnoticed by residents because market vendors self-regulate food prices (Plattner 1985; Pottier 1999). Perhaps this is the reason why I find that residents who live longer in the food desert select to shop at a store with less available food but in closer proximity to their home.

The resulting obesity risk from shopping patterns reveal that shopping at a supermarket increases obesity risk, most likely, due to the type of purchases residents make. Shopping closer to their residence also increases obesity risk but the relationship weakens to suggest that the open air market and a selection of the convenience stores offer residents adaptive capacity to improve their dietary intakes. The relationship weakens even more when the nutritional quality of the store is included in the analysis. And, I find that shopping at a store with more fresh and affordable foods does not influence obesity risk. Thus, it appears that the residents who select to adapt by shopping for more affordable and better quality sources may improve the quality of their diets. Those residents appear to have the most experiences and longest exposure to the nutritional and economical tradeoffs I find utilized in the San Lorenzo food desert.

Concluding Remarks

The presence of a food store facilitates the purchase and consumption of healthy food groups if healthy food varieties are available and affordable (Inagami, Cohen, Finch, & Asch, 2006; Zenk, Lachance, Schulz, et al., 2009). Food deserts are the collection of deprived food environments (Cummins, et al., 2010; Farley, Rice, Bodor, Futrell, & Rice, 2010; Freedman, 2009; Macdonald, Ellaway, & Macintyre, 2009; Wrigley, Warm, & Margetts, 2003). Exposure to food deserts amplifies individual risk factors for obesity through various dietary and purchasing behaviors (Winkler, Turrell, & Patterson, 2006; Wrigley, 2002; Wrigley, et al., 2003). A mediating feature in the food desert occurs when residents have the means to travel outside of the food desert boundaries and into more nutrient-rich and affordable food environments (Inagami, Cohen, Brown, & Asch, 2009; Rundle, Neckerman, et al., 2009).

In the Global North, supermarkets prevent the emergence of food deserts by providing healthy food options (Cummins, Smith, et al., 2009; Freedman & Bell, 2009; Glanz, Sallis, et al., 2007). Fresh produce, in particular, is more affordable and available in supermarkets than in the smaller, more local stores (Farley, Rice, et al., 2009; Glanz, Sallis, et al., 2007; Winkler, Turrell, et al., 2006; Zenk, Schulz, et al., 2005). Urban residents that live near and shop at a supermarket reduce their risk for obesity because they have the opportunity to access healthier and more affordable food than residents who live farther away (Inagami, Lee, & Friis, 2006; Macintyre, Macdonald, & Ellaway, 2008; Winkler et al., 2006; Wrigley, Warm, et al., 2002).

In San Lorenzo, however, I find that the overall dietary patterns among all residents encourage the consumption of energy-dense sweets, snacks, carbohydrates and beverages, particularly among children and adolescents. I find that diet plays a role in promoting obesity even among San Lorenzo residents with low intake of healthy food varieties to indicate "hidden hunger," a double burden (Burchi, Fanzo, & Frison, 2011). Household coping strategies and shopping behaviors developed in response to improve relative food access and buffer against price fluctuations reduces obesity risk and improves local food access. The open air market and the availability of convenience stores offer adaptive capacity for residents to improve their dietary intakes, and those residents with the longer experience in the food desert select to positively adapt.

Chapter 6

DISCUSSION AND CONCLUSION

In this dissertation, I used data collected from a country in the Global South (Paraguay) to test against the findings from Global North food deserts. In this chapter, I will compare and contrast my findings with findings from the Global North food desert literature. The following table summarizes the results of this study and the corresponding hypothesis.

Table 6.1

Results of Hypotheses Tests

Food Desert Hypothesis	Paraguay Result
H1.a The smaller, convenient stores will lack fresh food at an affordable price.	Not a Finding
H1.b The supermarkets will be the best source of affordable quality food over other food stores in the environment.	Not a Finding
H2.a Residents will identify poor access to transportation as a key factor in their decision to shop at a store.	Found
H2.b Residents will identify access to store credit as a key factor in their decision to shop at a store, and the lowest income residents will utilize store credit services when shopping for food.	Found
H2.c Personal barriers will emerge from interpretation of household shopping strategies	Not a Finding
H3.a Households with lower incomes are more likely to consume fewer varieties of fruits and vegetables	Not a Finding
H3.b Households with access to personal vehicles are likely to have increased dietary variety, particularly are likely to consume more varieties of fruits and vegetables	Found for Dairy; Not for Produce
H3.c Households that shop at supermarkets are likely to consume more fruits and vegetables and have a lower BMI overall	Not a Finding

First, I needed to establish that a food desert did exist in San Lorenzo. As researchers had done in the Global North, I used the NEMS-S as the measure to determine if a food desert existed in San Lorenzo, Paraguay. A perfect score on NEMS-S suggests the store offers enough healthy food varieties at affordable prices to support the basic needs and dietary preferences for local residents (Glanz, Sallis, Saelens, & Frank, 2007). However, my results found that the highest scoring store yielded only 55% of the total points. This score indicates that San Lorenzo is a *city-wide* food desert. When examining the *Rio Barrio* separate from the city of San Lorenzo, the NEMS-S score was lower (47%) so it too is a food desert. Thus, I have identified a Global South food desert within an urban environment in the country of Paraguay.

Second, I needed to determine if the supermarkets in San Lorenzo provide healthier food options. In the Global North, supermarkets are thought to prevent the emergence of food deserts because they provide healthy food options (Cummins, Smith, et al., 2009; Freedman & Bell, 2009; Glanz, Sallis, et al., 2007). In Paraguay, however, I found that supermarkets in San Lorenzo provide more food variety, but failed to provide fresh and affordable produce (H1.b). The San Lorenzo open air market ranked consistently higher across all NEMS-S scales. This higher score indicated that in the food desert of San Lorenzo the open air market may be a better source of affordable and fresher food varieties, not the supermarkets. However, in *Rio Barrio* of San Lorenzo, some residents indicated a perception that the open air market is unsafe. If residents avoid the market because of the safety issue, then they may choose to use a *despensa* to meet their food needs. Thus, it seems that having a liaison, such as a *despensa* owner, go to the open air market, purchase bulk food items, and resale it in the *barrio* appears to provide an adaptive capacity for local food desert resident to improve their relative access to fresh food at an affordable price (H1.a).

Ethnographic research from the US and UK previously found that informal networks and relationships can improve local access to food sold in stores (Graham, Kaufman, Novoa, & Karpati, 2006; Kaufman & Karpati, 2007). Researchers found the incidence of emic (subjective) factors that residents derive from their food environments influence their shopping and coping strategies (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Jilcott, Laraia, Evenson, & Ammerman, 2009; Kaufman & Karpati, 2007). In Paraguay, a thriving informal economy prevails to influence shopping behaviors and improve local coping strategies. I found that some food desert residents favor *despensas* over supermarkets because residents can establish more direct connections to create store credit lines during periods of low cash flows (H2.b). Interestingly, the observations (1) that smaller stores allow the owner and shopper to create more informal relationships, which provides adaptive capacity for lower income residents and (2) that supermarkets are perceived to be a cleaner, safer, and more secure food source are found across the Global North and South divide.

In the Global North, food deserts are the result of exclusionary zoning practices that create fragmented and uneven city infrastructure (Papas, et al., 2007; Rundle, Diez Roux, & Freeman, 2007; Wrigley, 2002). There, food desert residents often identify poor access to reliable city transportation as a key factor in shopping strategies (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Kaufman & Karpati, 2007). Primarily, residents rely on friends and neighbors for rides to the store (Burns & Inglis, 2007; Lopez-Zetina, Lee, & Friis, 2006; Pendola & Gen, 2007; Townshend & Lake, 2009) or, they buy in bulk to reduce the number of trips they need to make to sustain food supplies in their house (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Joshu, Boehmer, Brownson, & Ewing, 2008). However, in San Lorenzo, I find that the city lacks the political power and local revenue to develop transportation routes and regulate city services in local *barrios*. Most *Rio Barrio* residents stated that transportation access is poor, but they explain that the city infrastructure and transportation systems lack security and safety. Thus, I find that the lack of safe transportation amplified the effects of food deserts and influenced shopping decisions (H2.a).

In some of the Global North research, it was found that negative coping strategies emerge from local perceptions and identify them as 'personal barriers' that prevent residents from accessing larger and better quality food stores (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Dobson, Beardsworth, Keil, & Walker, 1994). Personal barriers result from local perceptions that relate to feelings of exclusion when people shop (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Dobson, Beardsworth, Keil, & Walker, 1994). In *Rio Barrio*, San Lorenzo, I did not find that personal barriers emerged from feelings of exclusion (H2.c); instead, I found that the lack of security and safety prevented residents from shopping at better quality and more economical stores (supermarkets and the open air market). Additionally, I find that residents employ cooking strategies that encourage bulk purchases. The preparation of *seco* (dry) and *caldo* (wet) meals can be bought in the bulk bins at any store. Thus, the *Rio Barrio* residents appear to manage barriers through household behaviors to ameliorate poor food access rather than create them.

However, I do find some examples that residents view their exclusion from political parties as impacting the price of key food items in the local food environment. 'The liberals tell us that if they enter office they will lower [prices] ... Meat used to be really cheap and we would buy it from here (San Lorenzo) but now it's more expensive... It's the Colorado politician's fault for closing down the meat factories..." (from Interview, SL08027, HG001). The role of politics and political parties with the food economy may indeed reduce food access for the residents of *Rio Barrio*; therefore, in the Global South, corruption and less transparent regulatory systems may present more severe barriers than those presented the Global North. Perhaps, researchers should not limit 'personal barriers' to exclusion in stores, but should expand our perspectives into a broader understanding of how cities and structural barriers develop. Using this broader understanding, we can then identify new forms of governance and assistance that might liberate food desert residents from structural and political barriers.

Most studies in the Global North found that household income predicts the consumption of fruits and vegetables (Bertrand, Therien, & Bloutier, 2008; Cummins, et al., 2009; Zenk, Schulz, et al., 2009); only one food desert case found that income fails to increase the likelihood of fruit and vegetable consumption in residents (Zenk, Schultz, et al., 2005). Shopping at a supermarket in the Global North predicted increased fruits and vegetables in local diets (Michimi & Wimberly, 2010; Moore, Roux, Nettleton, & Jacobs, 2008; Zenk, Lachance, Mentz, Kannan, & Ridella, 2009). In *Rio Barrio,* San Lorenzo, I did not find that income predicted fruit and vegetable consumption (H3.a). I found that owning a car improves dietary intake, but not in fruits and vegetables. I found that owning a car improves the consumption of dairy since data from the interviews indicated that dairy is difficult to find in the food desert except at supermarkets (H3.b); most residents use a personal vehicle to access supermarkets in San Lorenzo. However, in *Rio Barrio,* shopping at supermarkets did not predict the consumption of fruits and vegetables nor does it lower individual BMI (H3.c).

Lytle (2009) challenges food environment researchers to test a different hypothesis; if food environments are restricted in regard to the availability and accessibility of healthy, inexpensive food options in local stores, then it is more likely that the physical environment will play a stronger role in residential food choices than social and personal preferences. Lytle (2009) claims that if the physical environment plays a stronger role, then residents are more likely to be at greater risk for obesity because food environments limited in food resources are food deserts. Poor quality food environment (e.g. food deserts) independently associate with obesity prevalence (Bodor, Rice, Farley, Swalm, & Rose, 2010; Booth, Pinkston, & Carlos Poston, 2005; Macdonald, Ellaway, & Macintyre, 2009)

In *Rio Barrio*, San Lorenzo, I tested whether or not store ranks could predict obesity rates. I found that stores ranked high for food availability predicted obesity rates among household food decision makers (p=0.017). The top ranked stores included all store types observed in the San Lorenzo food desert (including *despensas*, supermarkets, and the open air market). In the Global North, residents that shop at stores with a wide variety of foods available are more likely to consume healthier diets. In the Global South, however, residents shopping at supermarkets tend to buy food items that are on sale or lower priced, which leads residents to purchase packaged or bulk food items, and/or less fresh (Hawkes, 2008) leading to a less healthy diet.

In addition, I found that stores ranked highly in affordability predicted obesity, but the relationship is weaker (p=0.041). The stores with high ranks in affordability include the open air market and the *barrio despensas*. In the Global South, researchers suggest that the presence of the informal economy allow smaller stores owners and market vendors to self-regulate food prices and improve local food access (Plattner 1985; Pottier 1999). In San Lorenzo, *despensas* owners offer store credit, particularly to the shoppers who have established an owner-client relationship over a long period of time. Although prices in smaller stores may be a little more expensive than in larger retailing supermarkets, the ability to access store credit improves local household food economies expanding access of the residents to affordable, healthier food selections (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Graham, Kaufman, Novoa, & Karpati, 2006; Kaufman & Karpati, 2007).

Future research plans should continue to examine the three lines of inquiry that I identified in the literature for this case study. However, researchers need to make methodological modifications to better integrate the three lines into one cohesive analysis. The results of the case in *Rio Barrio*, San Lorenzo provides support for Lytle's (2009) hypothesis that the physical environment plays a stronger role in residential food choices than social and personal preferences. This hypothesis should be used in future research as a starting point to examine deprivation in food environments and its connections with local health concerns. The more restricted an environment is to available, affordable, and healthy foods, the more likely the physical environment influences food choices and shopping behaviors. As food environments improve access to healthy and affordable foods, the more likely social and personal preferences will play a role in food choices and shopping behaviors. In the following sections, I outline the ways in which I plan to advance future research in the San Lorenzo Food Desert.

Research Line Inquiry 1: Deprived Food Environments

Deprivation in the food environment amplifies individual risk factors for obesity (e.g., high energy intakes and low physical activity) (Cummins, Smith, et al., 2010; Farley, Rice, Bodor, Futrell, & Rice, 2010; Freedman, 2009; Macdonald, Ellaway, & Macintyre, 2009; Wrigley, Warm, & Margetts, 2003). As a process, deprivation limits or removes residents from the resources they need each day to be healthy, including food, water, sanitation, and shelter. In the Global North, neighborhood and city food deprivation ties to exclusionary practices by zoning and planning committees at political levels (Papas, et al., 2007; Rundle, Diez Roux, & Freeman, 2007; Wrigley, 2002); however, in the Global South, municipalities and planning committees lack political power and local revenue needed to design non-exclusionary infrastructure and city services (Hall, 2005). Most people, in the Global South, rely on an informal economy for income, food, health care, and shelter (Freire, 2005; Hall, 2005). The results of this dissertation found that food deserts have emerged in Paraguay. However, how these food deserts develop requires a larger sample size and more periods of surveillance of the food environment to mark major changes in local food access.

Cities in the Global South are experiencing rapid urbanization and changes in their local food environments. Theoretically, cities in the Global South result from one of two types of growth processes (Hall, 2005): (1) cities that grow at the cost of informality, or (2) cities that cope with dynamic growth. The first group includes the cities where the urban economy cannot keep pace with the growth of the population because the informal economy cannot compete. The second group includes cities where the urban economy keeps pace with population growth because the local economy includes both formal and informal opportunities. These cities include downtown business districts with modern buildings, factories, and informal slums and often attract investment from the Global North or more industrialized countries. Regardless of which process, census areas remain fragmented and uneven across cities in the Global South (Freire, 2005; Hall, 2005).

San Lorenzo and other Paraguayan cities can cope with dynamic growth. In 1991, Paraguay signed the Treaty of Asunción to open trade markets with Argentina, Brazil, and Uruguay known as Mercosur (Common Market of South America). Prior to this agreement, Argentina and Brazil made up about 40% of all Paraguay's foreign investments; after the signed agreement, Mercosur made up about 70.6% of all Paraguay's foreign investments (Mora, 1998). Mercosur makes it possible for food distributors to cheaply access food products from Argentina, Brazil, and Uruguay and allow food vendors to self-regulate local food prices. The open air market provides adaptive capacity to improve local food access to city residents (Plattner 1985; Pothukuchi & Kaufman 1999; Pottier 1999). In San Lorenzo, I found that the store ranks of local *despensas* improved as a result of local access in open air markets, thus, reducing the effect of structural deprivation on the poorest residents.

In future research, I plan to increase the sample size, include additional neighborhood sites and cities, and proceed using a longitudinal, cross-sectional research design. Most studies report larger sample sizes and greater spatial coverage of city areas (Bertrand, Therien, & Cloutier, 2008; Freedman, 2009; Moore & Diez-Roux, 2006; Moore, Roux, Nettleton, & Jacobs, 2008; Sharkey, Horel, Han, & Huber, 2009). A major limitation in the *Rio Barrio*, San Lorenzo case of deprived food environments is the small size. The data are missing a large proportion of the city population including men. Also, it has a very small food store sample. The results of local stores, particularly for supermarkets, are limited containing only the 4 in San Lorenzo. So, the data fails to represent potential variation that may exist across Paraguayan municipalities. By expanding the study site in spatial dimension and including other, less impoverished municipalities in Paraguay, it will provide a better representation of the food environment in urban Paraguay.

Food environment scholars require quick assessment tools to identify deprived food environments that allow a rank ordering on the availability, affordability, and quality of local food stores (Gittelsohn, et al., 2007; Lytle, 2009). The NEMS-S complies with this assessment (Lytle, 2009). Only two other studies reported the use of a modified NEMS-S where the instrument was modified to fit the local field site and time allowances. One study simplified NEMS-S by focusing on healthy food items (Gittelsohn, et al., 2007). The other study created a three category measure for produce freshness (Andreyeva, Blumenthal, Schwartz, Long, & Brownell, 2008). In San Lorenzo, I focused on the basic foods needed to create balanced meals (e.g., healthy food items) and I used a three category measure for produce freshness. However, in the future, the NEMS-S item list needs to be reduced if researchers are to be welcomed by local business owners because completion of the survey often interrupts local business transactions (Gittelsohn, et al., 2007).

In future research, I plan to further modify the NEMS-S to include more bulk food items and unhealthy food items. In the current version, I measure for two varieties of each produce item to examine variety in pricing structure; however, results failed to reveal variation, and were dropped from analysis in the score sheets (see Appendix A). As a result, future applications will not include a high price and a low price for produce measures; but will include more bulk foods (rice, pasta, and beans), including unhealthy snacks (cookies, crackers, and sweet cakes).

The inclusion of unhealthy food items appears important because the consumption of sweets, snacks, and carbohydrates among children is high in the *barrio*. However, the current data cannot make a connection between the availability of those items and dietary consumption patterns because the current version of Paraguay NEMS-S fails to include unhealthy food items.

In addition, the inclusion of other neighborhoods and city areas will allow for a resample and retest of the Paraguay adapted NEMS-S to increase the validity and reliability of the interview instrument. I will seek to include more city areas with market sources to test the validity of the NEMS-S modifications that I made for sampling the open air market. A larger and wider sample will allow me to evaluate if cities that lack open air markets and rely only on supermarkets have better or worse food environments than cities with access to open air markets. Additionally, I will examine if cities that lack access to open air markets also have poorly ranked *despensas*. Given the fact that *despensa* owners depend on the open air market to supply their stores with food resources, it stands to reason that *despensa* owners may encounter food access challenges when markets are not locally available.

Finally, longitudinal and cross-sectional case study design allows for the surveillance of changes in the food environment and food pricing structures. However, very few studies employ longitudinal research designs (Wang, Cubbin, Ahn, & Wikleby, 2007). Most examine historical and municipal data to identify major changes in the food environment (Sallis, Nadar, Rupp, Atkins, & Wilson, 1986; Wang, Cubbin, Ahn, & Winkleby, 2007; Wang, Gonzalez, Ritchie, & Winkleby, 2006; Wrigley, 2002). In Paraguay, cities lack data to inform how the food environment and local *barrios* have changed over time. Additionally, a current political campaign promotes the closing of open air markets and the development of larger retailing supermarkets. In the Global North, increasing supermarkets improves local food environments. In San Lorenzo, this case study finds that the supermarkets do not improve the food environment. Whether or not this observation holds over time in Paraguayan cities will require a larger research sample size and longitudinal, cross-sectional surveillance of changes in the development (and promotion) of newer food retailing stores.

Research Line Inquiry 2: Residential Perceptions of Access and Subsequent Coping Strategies

The subjective categories (emic observations) residents perceive about their access do not always align with rational choice (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009). A major criticism of the current food desert scholarship claims that researchers assume too much rational choice in the decision of individual residents in selecting food stores (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Jilcott, Laraia, Evenson, & Ammerman, 2009; Kaufman & Karpati, 2007). The critique also identifies that the 'food desert' as a term is a metaphor relating the subjective feeling of isolation with the objective reality of social exclusion (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009). However, researchers fail to systematically address the emic categories associated with social exclusion and rely on interpretative explanations of local perceptions (Kaufman & Karpati, 2007).

Thus, the primary modification I plan to make in this line of inquiry is one that will improve methodological rigor in future research. In the *Rio Barrio* case study, I employed semi-structured and ethnographic interviews because there is very little published information about Paraguayan food customs and household strategies. Food desert researchers that employ text interviews to identify residential perceptions focus on interpretations of data content. An interpretation of text content is meaningful to develop nutritional interventions in local communities. However, semi-structured interviews are generally less rigorous and limit researchers from including large sample sizes or cross-cultural comparisons. Therefore, increasing the sample size requires that I change the tools that I use in identifying local residential perceptions. I will plan to use a cultural consensus tool, and I will use the text from the ethnographic observations to develop the items tested with the consensus tool.

Cultural consensus procedures have high validity and reliability (Romney, Weller, & Batchelder, 1986; Weller, 2007). The procedures have proven successful in health-focused research (Brewis & Gartin, 2006;

Curry, Mathews, Daniel, Johnson, & Mansfield 2002; Dressler, Grell, & Viteri, 1995; Garro, 1996; Pelto & Pelto, 1997) and in Paraguay research relating to obesity "fat stigma" norms and perceptions (Brewis & Wutich, 2012; Brewis, Wutich, Falletta-Cowden, & Rodriguez-Soto, 2011). Cultural consensus analysis allows researchers to systematically examine the consensus and variation on highly salient domains relating to cultural perceptions, knowledge and beliefs (Pelto & Pelto, 1997; Romney, 1999; Romney, Weller, & Batchelder, 1986).

A cultural domain is a set of related items that share underlying factors (Furlow, 2003; Weller, 2007). The analysis of cultural knowledge identifies the level to which people agree on a topic or issue in a cultural domain (Garro, 1986; Romney, 1999; Romney, Weller, & Batchelder, 1986; Weller, Romney, & Orr, 1986). Those respondents with the most shared agreement are considered culturally competent (Furlow, 2003; Romney, Weller, & Batchelder, 1986). Cultural consensus analysis expands scientific understandings of the knowledge domains that exist for the whole population and for sub-group populations (Garro, 1996; Gartin, Brewis, & Schwartz, 2010; Weller, 2007).

In terms of food deserts, the common domains include perceptions about city infrastructure, transportation, and food stores, including the price, availability and quality of culturally significant food items sold in the food environment (Inagami, Cohen, Finch, & Asch, 2006; Kaufman & Karpati, 2007; Michimi & Wimberly, 2010; Rundle, Neckerman, et al., 2009). Integrating these domains into one cultural analysis will amplify the ways in which food environments are locally contested and perceived by residents. Other domains relating to social exclusion and justice are also present in the literature (Kaufman & Karpati, 2007) and in San Lorenzo where these domains are termed mostly by lack of security and political parties. These domains will be included in future research.

Research Line Inquiry 3: Interaction of food desert and residential access/strategies with health concerns

The presence of a food store facilitates the purchase and consumption of food (Bertrand, Therien, & Bloutier, 2008; Cummins, et al., 2009; Zenk, Schulz, et al., 2009). When residents live in a food desert, the available food varieties are mostly unhealthy (obesogenic), expensive, or completely missing from residential neighborhoods (Cummins, Smith, et al., 2010; Gallagher, 2006; Wrigley, Warm, et al., 2003; Wrigley, Warm, et al., 2002). Consequently, exposure to poor nutritional status increases (Inagami, Cohen, Finch, & Asch, 2006; Zenk, Lachance, et al., 2009). A mediating factor in the food desert occurs when residents have the means to travel outside of the food desert boundaries and into more nutrient-rich and affordable food environments (Michimi & Wimberly, 2010; Rundle, Neckerman, et al., 2009). Additionally, the relationships residents establish with neighbors and smaller corner stores can improve residential access to store credit (Bowyer, Caraher, Eilbert, & Carr-Hill, 2009; Jilcott, Laraia, Evenson, & Ammerman, 2009; Kaufman & Karpati, 2007). Thus, the ways in which residents access food stores and the quality of those stores directly affects health outcomes in local populations (Inagami, Cohen, Finch, & Asch, 2006; Wang, Cubbin, Ahn, & Wikleby, 2007).

In San Lorenzo, I find that residents with longer exposure or residence in the food desert shop for convenience rather than quantity. It is also likely that residents who live longer in the food desert realize the importance in establishing relationship with local store owners because they participate in the *libreta* system of store credit. In future research, I plan to change the study design into a longitudinal, cross-sectional study design to assess the food environment with NEMS-S over different periods of time. I also plan to integrate cultural consensus procedures to identify local perceptions and cultural domains related to food deserts alongside NEMS-S assessments. In addition, I plan to take nutritional and health assessments on populations. The data will allow me to explain how exposure amplifies nutritional risk and how food stores are social constructed by local residents. The study will examine if changes in the food environment change dietary patterns over time. For example, a US study examined changes in a food desert over a period of 10 years (Wang, Cubbin, Ahn, & Winkleby, 2007). Researchers found that the consumption of sweets and salty snacks increased from the increased exposure to convenience stores, which amplified obesity risks in local populations and resulted in increased BMI over time (Wang, Cubbin, Ahn,

& Winkleby, 2007). I plan to determine if similar changes elicit similar changes in food deserts in Paraguay.

As more evidence compiles at the nexus of food deserts and residential interactions, researchers can improve local interventions (Ayala, 2009; Cummins, Petticrew, Higgins, Findlay, & Sparks, 2005; Gittelsohn, et al., 2007; Petticrew, Cummins, Sparks, & Findlay, 2007; Wrigley, 2002). Nutritional interventions in the US and UK reveal how local knowledge of the food environment improves success rates in at-risk, food desert residents (Ayala, 2009; Cummins, Petticrew, Higgins, Findlay, & Sparks, 2005; Petticrew, Cummins, Sparks, & Findlay, 2007). Each intervention increased the promotion of healthy food stores in deprived food environments and relied on residents to spread the word through their neighborhood social networks to change the perceptions people hold about their food stores. The results from the interventions reveal that researcher knowledge of local perceptions and their subsequent patterns of behavior and interactions will improve the success rates of nutritional interventions.

For example, in the UK, public health advocates worked with local policy makers and commercial developers to promote the construction of a supermarket in a community with no access to supermarkets (Cummins, Petticrew, Higgins, Findlay, & Sparks, 2005; Petticrew, Cummins, Sparks, & Findlay, 2007). Health researchers found that after the first round of promotional campaigns residents improved their feelings of exclusion from the change (Cummins, Petticrew, Higgins, Findlay, & Sparks, 2005). After the second round of promotional campaigns, researchers found residents improved their fruit and vegetable intake and more shoppers switched their shopping to the new supermarket (Petticrew, Cummins, Sparks, & Findlay, 2007).

Another Global North example, in the US an intervention with Latino immigrant populations revealed how funding support improved the quality of local stores and increased the perception of the store in among local residents. The Latino residents were primarily newer immigrants to the US and the stores served to assist in the acculturation of immigrant populations into US food environments and food varieties (Ayala, 2009). The intervention focused on marketing the healthy food available in store displays, signage, and radio commercials (Ayala, 2009). In addition, the health worker trained store personnel to become produce specialists that recommended and promoted the consumption of fresh food over packaged foods (Ayala, 2009). Post-intervention analysis found that local store shoppers increased their produce intake by at least one additional serving of fresh produce a day.

In *Rio Barrio*, San Lorenzo, I find that children consume obesogenic foods as snacks and eat more meals than adults. The majority of my sample found both adults and children were overweight or obese. Field observations reveal that the foods most readily available around the school are low in nutritional content and high in sugar and carbohydrates.

Incidentally, the majority of the sample consumes bread, but in my exploration of the food environment, I did not find any bread that was not white bread. Also, many adult residents skip meals or eat fried food at night for dinner, which are likely to increase obesity risk. Improving the accessibility of healthier foods in the neighborhood and at the stores is a starting place to begin local interventions and nutritional education programs in San Lorenzo food environments.

Conclusions

The Global Food Crisis of 2008 and 2011 exposed how interconnected our food networks have become. In 2008, the executive director of the World Hunger Program stated: We're seeing more people hungry and at a greater numbers than before. There is food on the shelves but people are priced out of the market (Holt-Giménez & Peabody, 2008). The World Bank estimated that an additional 100 million more people have been driven into hunger because of the rising food prices. In the Global South, local residents experience rising food prices more acutely, and there tends to be a greater public demand for governments to control the prices of food staples (Saltmarsh, 2009). Researchers no longer examine only the quantity of resources that people have to establish their security (Davies, 1993; Maxwell, 1996); instead, we focus on the quality of local food environment to establish community food resources and security (Burchi, Fanzo, & Frison, 2011). In doing so, we must draw valid and statistical links between exposure to food environments and actual residential behavior within a poor or deprived food environment (see Cummins & Macintyre, 2006). In today's global world, researchers seldom discuss a diet dichotomy (Popkin, 1994); instead, we hypothesize that one global diet now spreads throughout our transnational food networks (Popkin, 2006). Therefore, food deserts where quality food is neither available nor affordable must be a subject of global health research since its absence will increase the global health risks.

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APPENDIX A

PARAGUAY NEMS-S SAMPLE FORMS

The following images are data forms from two stores. The first is a supermarket (ID=210101) and the second is a *despensa* store (ID=080207). Also included are the summary “score sheets” for both stores. The final sheet shows the scoring table for both stores.

Rater ID ☐☐ Store ID: 2 1 8 1 0 1

NEMS-S PARAGUAY ADAPTATION

MEASURE #1: MILK- LECHE

J **1. Is regular milk (1L) available?**

☑ Yes, list lowest price: 2.915

☐ No

E **2. Is low-fat (lite) milk (1L) available?**

☑ Yes, list lowest price: 2.990

☐ No

MEASURE #2: YOGURT - YOGUR

1. Is regular yogurt (1L) available?

☑ Yes, list lowest price: 4.075

☐ No

2. Is low-fat (lite) yogurt (1L) available?

☑ Yes, list lowest price: 7.729

☐ No

Measure #3 – Yerba Mate

Availability and Price

Instructions: Only select the Yerba Mate item with a net weight 500 g. Only enter a brand for 'other' when none of the listed items are available. List in 'other' the lowest priced option.

Item	Available		Price	Comments
Healthy Option:				
1. Selecta (select lowest price)	☐ Yes	☐ No	3.190 ~~[illegible]~~	one may be cheaper but price not listed w/white label
2. Pajarito Blanco (has a white top)	☐ Yes	☒ No		
3. Campesino Lite	☐ Yes	☒ No		
Regular Option:				
M **4. Pajarito** (select lowest price)	☒ Yes	☐ No	~~4 555~~	~~[illegible]~~ (3.920)
5. Campesino (select lowest price)	☒ Yes	☐ No	~~[illegible]~~	3.435
6. Kurupi (select lowest price)	☒ Yes	☐ No	3.805	
7. Indegna (select lowest price)	☒ Yes	☐ No	3.250	~~[illegible]~~ sale price
8. Other	☐ Yes	☐ No		

0 - Unacceptable Quality = bruised, old looking, mushy, dry, overripe, dark, sunken spots in irregular patches, cracked or broken surfaces, signs of shriveling, mold, or excessive softening
1 - Acceptable Quality = in good condition, good color, some spotting or marks acceptable
2 - Excellent Quality = top quality, great/perfect color, fresh, firm, and clean

If torn, but can buy a kilo go up in score. or decent % of them.

diff. issues but sim.

Item	Available (Yes or No)	Price (Guaranies)	# units	Unit (Pc o Kilo)	Percent acceptable 0	1	2	Comments
1. Red Apple (Manzana)	Y	Highest Price: 9.600	1	Kilo	☐	X	☐	Some bruising ↑ similiar in quality
	Y	Lowest Price: ~~7.190~~ 5.250	1	Kilo	☐	X	☐	generally good color some bruising
2. Bananas (Platano)	Y	Highest Price: 7.490	1	Kilo	X	☐	~~☐~~	look firm? feel good
	Y	Lowest Price: .690	1	Kilo	X	☐	☐	1/2 green others out a few look good THIS IS HARD w/ 3 Category
3. Oranges (Naranja)	Y	Highest Price: 2.850	1	Kilo	☐	X	☐	hard, but good color
	Y	Lowest Price: 2.480	1	Kilo	☐	X	☐	1/2 + 1/2: green & brown, others orange + felt good.
4. Mandarines (Mandarinas)	Y	Highest Price: 2.850	1	Kilo	☐	X	☐	some soft but others firm.
	Y	Lowest Price: 1.190	1	Kilo	X	☐	☐	squishy, sunken
5. ~~Green~~ Lime (Limón ~~Tahiti~~)	Y	Highest Price: 2.890	1	Kilo	X	☐	☐	peel hardened on most
	Y	Lowest Price: 1.980	1	Kilo	X	☐	☐	hard + not colored all way through

Item	Available (Yes or No)	Price (Guaranies)	# units	Unit (Pc o Kilo)	Percent aceptable 0	1	2	Comments
1. Tomatoes (Tomates)	Y	Highest Price: 2.990	1	Kilo	X	☐	☐	still pretty green some irreg. patches but still juicy + fresh
	Y	Lowest Price: 1.980	1	Kilo	~~X~~	X 1	☐	b/c of 2nd bin by onions bad color.
2. Onion (Cebolla)	Y	Highest Price: 12.900	1	Kilo	X	☐	☐	red (somewhat rotten)
	Y	Lowest Price: 3.750	1	Kilo	☐	X	☐	yellow 2/3 : 1/3 bottom rotten; top
3. ~~Green~~ Bell Pepper (Locote)	Y	Highest Price: ~~[illegible]~~ 15.980	1	Kilo	☐	X	☐	yellow 1/2 + 1/2
	Y	Lowest Price: 3.980	1	Kilo	X	☐	☐	green generally bad coloring
4. Carrots (Zanahoria)	~~[illegible]~~ Y	Highest Price: 3.610	1	Pc	X	☐	☐	
	Y	Lowest Price: 2.980	1	Kilo	☐	X	☐	1/2 + 1/2
5. Manioc (Mandioca)		Highest Price:			☐	☐	☐	
	Y	Lowest Price: 9.910	1	Kilo	☐	X	☐	

* exclude scallions

Rater ID

Store ID: 210101

NEMS-S PARAGUAY ADAPTATION

Measure #6: Beef – Carne

Availability and Price

Item	Available	Price/ Kilo	Comments
Healthy Option:			
1. Lean Ground Beef (Carne Molido Primero)	☒ Yes ☐ No	21.990	couldn't ask
2. Lomo	☒ Yes ☐ No	27.990	
Regular Option:			
3. Standard Ground Beef (Carne Molido Segundo)	☒ Yes ☐ No	10.490	
4. Carnaza de 2ndo ~~da 1ra~~ (specify lowest priced)	☒ Yes ☐ No	14.990 ~~80990~~	
5. Guiso	☒ Yes ☐ No	12.990	~~couldn't ask~~
6. Costilla	☒ Yes ☐ No	8.990	

Measure #7: Flour

Availability and Price

Flour (Harina)	Available	# p/ Kilo	Price	Comments
Healthy Option:				
Corn Flour (Harina de Maíz)	☒ Yes ☐ No	1	2.700	
Regular Option:				
White Flour (Harina Blanco)	☒ Yes ☐ No	1	2.335	

Individual Store Availability

Store #: 210101

1) Milk	Yes	No	Price	Comments
Regular	1		2.915	
low-fat (lite)	1		2.99	
Yogurt	**Yes**	**No**	**Price**	**Comments**
Regular	1		4.075	
low-fat (lite)	1		7.729	

PRODUCE MEASURE	
Total Available	10
% of available	100%
Total Acceptable	3
% of acceptable	30%

2) Fruit	Yes	No	Name	Price	# Units	Unit	Acceptable		
Apples-high	1		super	9.6	1	kilo	0.5	% of available fruits	
Apples-low	1		rojo	5.25	1	kilo	0.5	SHARE	100%
Bananas-High	1		de oro	7.49	1	kilo	0	% of available fruits	
Bananas-Low	1		karape	0.69	1	kilo	0	HI/LOW	100%
Oranges-High	1			2.85	1	kilo	0.5		
Oranges-Low	1		natl	2.48	1	kilo	0.5	% of acceptable fruits	
Mandarines-High	1			2.85	1	kilo	0.5		25%
Mandarines-Low	1		natl.	1.19	1	kilo	0		
Lime-High	1		tahiti	2.89	1	kilo	0	Fruit Totals and %'s will	
Limes-Low	1		japones	1.98	1	kilo	0	calculate if answered with 1 or	
Fruit Totals	10	0					2.5	0	

3) Vegetable	Yes	No	Name	Price	# Units	Unit	Acceptable		
Tomatoes-High	1		apple	2.99	1	kilo	0	% of available vegetable	
Tomatoes-Low	1		st. cruz	1.98	1	kilo	0.5	SHARE	100%
Onion-High	1		red	12.9	1	kilo	0	% of available vegetable	
Onion-Low	1		yellow	3.75	1	kilo	0.5	HI/LOW	90%
Bell Pepper-High	1		yellow	15.98	1	kilo	0.5		
Bell Pepper-Low	1		green	3.98	1	kilo	0	% of acceptable vegetable	
Carrots-High	1			3.615	1	pc	0	where avail-	28%
Carrots-Low	1		natl.	2.98	1	kilo	0.5		
Manioc-High		1						Vegetable Totals and %'s will	
Manioc-Low	1			0.98	1	kilo	0.5	calculate if answered with 1 or	
Vegetable Totals	9	1					2.5	0	

4) Meat	Yes	No	Price	Comments
Lean Ground Beef	1		21.99	
Lomo	1		27.99	
Regular Ground Beef	1		10.49	
Carnaza	1		14.99	segundo
Guiso	1		12.99	
Costilla	1		8.99	
Meat Totals	6	0		

8) Yerba Mate	Yes	No	Price	Comments
Selecta	1		3.19	
Pajarito	1		3.92	
Campesino	1		3.435	
Kurupi	1		3.805	
Indegna	1		3.25	
Other				

7) Flour	Yes	No	Price	Comments
Corn Flour	1		2.7	
White Flour	1		2.335	

Rater ID M G

Store ID: 0 8 0 2
07

NEMS-S PARAGUAY ADAPTATION

MEASURE #1: MILK- LECHE

3.200

1. Is regular milk (1L) available? ☒ Yes, list lowest price: ~~3.600~~
☐ No

2. Is low-fat (lite) milk (1L) available? ☒ Yes, list lowest price: 4.700
~~☒~~ No

MEASURE #2: YOGURT - YOGUR

1. Is regular yogurt (1L) available? ☒ Yes, list lowest price: 4.500
☐ No

2. Is low-fat (lite) yogurt (1L) available? ~~☒~~ Yes, list lowest price: ______
☒ No

Measure #3 – Yerba Mate

Availability and Price

Instructions: Only select the Yerba Mate item with a net weight 500 g. Only enter a brand for 'other' when none of the listed items are available. List in 'other' the lowest priced option.

Item	Available		Price	Comments
Healthy Option:				
1. Selecta (select lowest price)	☒ Yes	☐ No	3.900	
2. Pajarito Blanco (has a white top)	☐ Yes	☐ No		
3. Campesino Lite	☐ Yes	☐ No		
Regular Option:				
4. Pajarito (select lowest price)	☒ Yes	☐ No	3.900	
5. Campesino (select lowest price)	☒ Yes	☐ No	6.200	
6. Kurupi (select lowest price)	☒ Yes	☐ No	6.000	
7. Indegna (select lowest price)	☒ Yes	☐ No	3.600	plastic bag.
8. Other	☐ Yes	☐ No		

Rater ID: G

Store ID: 090207

NEMS-S PARAGUAY ADAPTATION

MEASURE #4: Fruits - Frutas

0 - **Unacceptable Quality** = bruised, old looking, mushy, dry, overripe, dark, sunken spots in irregular patches, cracked or broken surfaces, signs of shriveling, mold, or excessive softening
1 - **Acceptable Quality** = in good condition, good color, some spotting or marks acceptable; if you [illegible] 1/2 is good or excellent
2 - **Excellent Quality** = top quality, great/perfect color, fresh, firm, and clean

Item	Available (Yes or No)	Price (Guaranies)	# units	Unit (Pc o Kilo)	Percent acceptable 0	1	2	Comments
1. Red Apple (Manzana)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 1.300	1	pc	☐	☐	X	(1) only one in fridge.
2. Bananas (Platano)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 2.000	1	kg	X	☐	☐	
3. Oranges (Naranja)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 4.000	1	kg	X	☐	☐	
4. Mandarines (Mandarinas)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 2.000	1	kg	☐	X	☐	
5. Green Lime (Limón Tahiti)	N	Highest Price:			☐	☐	☐	
	N	Lowest Price:			☐	☐	☐	

MEASURE #5: Vegetables - Verduras

Item	Available (Yes or No)	Price (Guaranies)	# units	Unit (Pc o Kilo)	Percent acceptable 0	1	2	Comments
1. Tomatoes (Tomates)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 3.500	1	kg	☐	X	☐	
2. Onion (Cebolla)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 3.500	1	kg	☐	☐	X	
3. Green Bell Pepper (Locote)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 3.500	1	kg	☐	X	☐	
4. Carrots (Zanahoria)	N	Highest Price:			☐	☐	☐	
	N	Lowest Price:			☐	☐	☐	
5. Manioc (Mandioca)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 1.000	1	kg	☐	☐	X	

Rater ID: 6 Store ID: 090207

NEMS-S PARAGUAY ADAPTATION

MEASURE #4: Fruits - Frutas

0 - Unacceptable Quality = bruised, old looking, mushy, dry, overripe, dark, sunken spots in irregular patches, cracked or broken surfaces, signs of shriveling, mold, or excessive softening
1 - Acceptable Quality = in good condition, good color, some spotting or marks acceptable; [illegible]
2 - Excellent Quality = top quality, great/perfect color, fresh, firm, and clean

Item	Available (Yes or No)	Price (Guaranies)	# units	Unit (Pc o Kilo)	Percent acceptable 0	1	2	Comments
1. Red Apple (Manzana)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 1.300	1	pc	☐	☐	X	(1) only one in fridge.
2. Bananas (Platano)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 2.000	1	kg	X	☐	☐	
3. Oranges (Naranja)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 4.000	1	kg	X	☐	☐	
4. Mandarines (Mandarinas)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 2.000	1	kg	☐	X	☐	
5. Green Lime (Limón Tahiti)	N	Highest Price:			☐	☐	☐	
	N	Lowest Price:			☐	☐	☐	

MEASURE #5: Vegetables - Verduras

Item	Available (Yes or No)	Price (Guaranies)	# units	Unit (Pc o Kilo)	Percent acceptable 0	1	2	Comments
1. Tomatoes (Tomates)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 3.500	1	kg	☐	X	☐	
2. Onion (Cebolla)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 3.500	1	kg	☐	☐	X	
3. Green Bell Pepper (Locote)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 3.500	1	kg	☐	X	☐	
4. Carrots (Zanahoria)	N	Highest Price:			☐	☐	☐	
	N	Lowest Price:			☐	☐	☐	
5. Manioc (Mandioca)	N	Highest Price:			☐	☐	☐	
	Y	Lowest Price: 1.000	1	kg	☐	☐	X	

Individual Store Availability

Store #: 80207

1) Milk	Yes	No	Price	Comments
Regular	1		3.2	
low-fat (lite)	1		4.7	
Yogurt	**Yes**	**No**	**Price**	**Comments**
Regular	1		4.5	
low-fat (lite)		1		

PRODUCE MEASURE	
Total Available	8
% of available	80%
Total Acceptable	4.5
% of acceptable	45%

2) Fruit	Yes	No	Name	Price	# Units	Unit	Acceptable		
Apples-high		1						% of available fruits	
Apples-low	1			1.3	1	pc	1	SHARE	80%
Bananas-High		1						% of available fruits	
Bananas-Low	1			2	1	kilo	0	HI/LOW	40%
Oranges-High		1							
Oranges-Low	1			4	1	kilo	0	% of acceptable fruits	
Mandarines-High		1							38%
Mandarines-Low	1			2	1	kilo	0.5		
Lime-High		1						Fruit Totals and %'s will	
Limes-Low		1						calculate if answered with 1 or	
Fruit Totals	4	6					1.5	0	

3) Vegetable	Yes	No	Name	Price	# Units	Unit	Acceptable		
Tomatoes-High		1						% of available vegetable	
Tomatoes-Low	1			3.5	1	kilo	0.5	SHARE	80%
Onion-High		1						% of available vegetable	
Onion-Low	1			3.5	1	kilo	1	HI/LOW	40%
Bell Pepper-High		1							
Bell Pepper-Low	1			3.5	1	kilo	0.5	% of acceptable vegetable	
Carrots-High		1						where avail-	75%
Carrots-Low		1							
Manioc-High		1						Vegetable Totals and %'s will	
Manioc-Low	1			1	1	kg	1	calculate if answered with 1 or	
Vegetable Totals	4	6					3	0	

4) Meat	Yes	No	Price	Comments
Lean Ground Beef		1		
Lomo		1		
Regular Ground Beef	1		18	
Carnaza	1		18	segunda
Guiso		1		
Costilla		1		
Meat Totals	2	4		

8) Yerba Mate	Yes	No	Price	Comments
Selecta	1		3.9	
Pajarito	1		3.9	
Campesino	1		6.2	
Kurupi	1		6	
Indegna	1		3.6	
Other				

7) Flour	Yes	No	Price	Comments
Corn Flour	1		3	
White Flour	1		2.8	

Item	Point Value	210101	80207
1) Milk			
Availability-			
YES Lite Milk Available	2	2	2
Price-			
Lower for lowest-fat	2		
Same for both	1		
Higher for low-fat	-1	(1)	(1)
2) Yogurt			
Availability-			
YES Lite Yogurt Available	2	2	0
Price-			
Lower for lowest-fat	2		
Same for both	1		
Higher for low-fat	-1	(1)	
3) Fruit			
Availability-			
0 varieties	0		
< 5 varieties	1		1
5-9 varieties	2		
10 varieties	3	3	
Quality-			
25-49% acceptable	1	1	1
50-74% acceptable	2		
75%+ acceptable	3		
4) Vegetables			

Availability-			
0 varieties	0		
< 5 varieties	1		1
5-9 varieties	2	2	
10 varieties	3		
Quality-			
25-49% acceptable	1	1	
50-74% acceptable	2		
75%+ acceptable	3		3
5) Carne-Beef			
Availability-			
YES Lean Ground Beef (Molida)	2	2	0
YES Beefsteak (Carnaza)	2	2	2
Price-			
Lower for lean ground beef	2		
Same for Both	1		
Higher for lean ground beef	-1	(1)	
Lower for Primera	2		2
Same for Primera & Segundo	1		
Higher for Primera	-1	(1)	
6) Flour			
Availability-			
YES Corn Flour (Harina de Maiz)	2	2	2
Price-			
Lower for Corn Flour	2		
Same for Both	1		
Higher for Corn Flour	-1	(1)	(1)

7) Yerba Mate			
Availability-			
YES Selecta Available	2	2	2
Price-			
Lower for Selecta	2	2	2
Same Price	1		
Higher for Selecta	-1		
Variety-			
All 4 Regular Options	2	2	2
2-3 Regular Options	1		
<2 Regular Options	0		
	Possible	Store Totals	Store Totals
Total Points	38	**18**	**18**
Total Points Availability	20	**19**	**12**
Total Points Price	12	**(3)**	**2**
Total Points Quality	6	**2**	**4**

Note: Points in Red and Parentheses indicate a negative number.

APPENDIX B

HUMAN SUBJECTS REVIEW DECISION AND HOUSEHOLD SURVEY INSTRUMENTS

The following pages provide the IRB approval and consent forms for both Phase I and Phase II of the project. Between the phases, I made modifications in the survey and consent forms, which are reflected here. In addition, I provide the household survey instruments (Household Roster & Food Frequency Questionnaire).

ARIZONA STATE UNIVERSITY
RESEARCH AND ECONOMIC AFFAIRS

Office of Research Integrity and Assurance

To:	Alexandra Brewis ANTH
From:	Mark Roosa, Chair Soc Beh IRB
Date:	11/19/2009
Committee Action:	**Expedited Approval**
Approval Date:	11/19/2009
Review Type:	Expedited F7
IRB Protocol #:	0911004527
Study Title:	La Comida Paraguaya: Perspectivas Culturales de Economias del Mercado y el Hogar
Expiration Date:	11/18/2010

The above-referenced protocol was approved following expedited review by the Institutional Review Board.

It is the Principal Investigator's responsibility to obtain review and continued approval before the expiration date. You may not continue any research activity beyond the expiration date without approval by the Institutional Review Board.

Adverse Reactions: If any untoward incidents or severe reactions should develop as a result of this study, you are required to notify the Soc Beh IRB immediately. If necessary a member of the IRB will be assigned to look into the matter. If the problem is serious, approval may be withdrawn pending IRB review.

Amendments: If you wish to change any aspect of this study, such as the procedures, the consent forms, or the investigators, please communicate your requested changes to the Soc Beh IRB. The new procedure is not to be initiated until the IRB approval has been given.

Please retain a copy of this letter with your approved protocol.

PARENTAL LETTER OF PERMISSION

Dear Parent:

I am a graduate student of Professor Alexandra Brewis in the School of Human Evolution and Social Change at Arizona State University. I am conducting a research study to understand how different household obtain food for the family and how they decide to cook, prepare, share, and buy healthy food.

I am inviting your child's participation, which will involve a survey about the foods that they have eaten in the past month, and will take measurements of their height and weight. If your child is over the age of 13, they will also complete a survey about how their emotional state. To complete these surveys, it will take approximately 20-30 minutes. Your child's participation in this study is voluntary. If you choose not to have your child participate or to withdraw your child from the study at any time, there will be no penalty. Likewise, if your child chooses not to participate or to withdraw from the study at any time, there will be no penalty. The results of the research study may be published, but your child's name will not be used.

Although there may be no direct benefit to your child, the possible benefits of your child's participation are improvements in dietary health problems and problems in accessing food. There are no foreseeable risks or discomforts to your child's participation.

All information in this study is confidential. In order to maintain confidentiality of your records, Meredith Gartin will use codes on all data forms, which will not be linked to your name. The results of this study may be used in reports, presentations, or publications but your child's name will not be used. Results will only be shared in the aggregate form.

If you have any questions concerning the research study or your child's participation in this study, please call me at (595) 0984 524 586 or Dr. Alexandra Brewis Slade at (0021 - 480) 727-9879.

Sincerely,

Meredith 'Luisa' Gartin

By signing below, you are giving consent for your child _______________ (Child's name) to participate in the above study.

______________________ ______________________ _____

Signature Printed Name Date

If you have any questions about you or your child's rights as a subject/participant in this research, or if you feel you or your child have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the Office of Research Integrity and Assurance, at (480) 965-6788.

ASU IRB
Approved
Sign S m
Date 11909 - 11810

'La Comida Paraguaya': Perspectivas Culturales de la Economía del Mercado y Hogar
LA CARTA DE PERMISO DE LOS PADRES

Estimado Padre de Familia:

Soy una estudiante de doctorado de la Profesora Alexandra Brewis en la Escuela de Evolución Humana y Cambio Social de la Universidad Estatal de Arizona. Estoy dirigiendo una investigación para aprender cómo diferentes hogares obtienen la comida a través de la familia y cómo deciden cocinar, preparar, compartir, y comprar alimentos.

Estoy solicitando la participación de su niño/a, cual incluirá una encuesta sobre las comidas que han comido en el mes pasado, y tomaré sus medidas de estatura y peso. Si su niño/a es mayor de 13 años, completará una encuesta sobre su estado de ánimo. Para completar estas encuestas, tomará aproximadamente unos 20 a 30 minutos. La participación de su niño/a en este estudio es voluntaria. Si Ud. decide que no quiere que su niño/a participe o dejar el estudio en cualquier momento, no habrá penalidad. Lo mismo, si su niño/a elige que no participar o dejar el estudio en cualquier momento, no habrá penalidad. Los resultados del estudio serán publicados, pero el nombre de su niño/a no será utilizado.

Aunque tal vez no haya beneficios directos para usted, los posibles beneficios de su participación en el estudio son que tal vez otros se puedan beneficiar de hacer mejores programas de dietas saludables. No hay riesgo o incomodidades que anticipemos en la participación de su niño/a.

Toda la información en este estudio es confidencial. Para mantener confidencialidad de sus datos, Meredith 'Luisa' Gartin usará códigos en todas las formas de datos, cual no llevaría su nombre o el nombre de su niño/a. Los resultados de este estudio se pueden usar en reportes, presentaciones y publicaciones, pero el nombre de su niño/a no se usará. Los resultados solo se compartiran de manera agregada.

Si tiene cualquier pregunta acerca de este estudio o la participación de su niño/a en este estudio, por favor, llámame a (595) 0984 534 586 o llama a Dra. Alexandra Brewis Slade (0021 -480) 727-9879.

Sinceramente,

Meredith 'Luisa' Gartin

Al firmar en el espacio de abajo usted da su consentimiento para que su niño/a
______________________ (el nombre del (la) niño/a) participe en este estudio.

______________	______________	_____
Firma	Nombre	Fecha

Si usted tiene preguntas sobre sus o sus niño/a derechos como participante en este estudio, o si piensa que usted o su niño/a ha sido puesto en riesgo, puede comunicarse con el director del Human Subjects Institutional Review Board, a través del ASU Office of Research Integrity and Assurance, al teléfono (0021) 480-965 6788

ASU IRB
Approved
Sign SM
Date 111909 - 111810

'La Comida Paraguaya': Cultural Perspectives of the Market and Household Economy
Arizona State University
ASSENT FORM (CHILD AGE 6-12)

My name is Meredith Gartin. I work at Arizona State University.

I am asking you to take part in a research study because I am trying to learn more about health and nutrition. I want to learn about the types of foods kids your age eat. Your parent(s) have given you permission to participate in this study.

If you agree, you will be asked to fill out a survey about how often you've eaten a list of foods. You will be asked to provide your height and weight. Answering these questions will take about 30 minutes, and your parent(s) will be in the room or nearby. You do not have to put your name on the survey. You do not have to answer any questions that make you uncomfortable.

You do not have to be in this study. No one will be mad at you if you decide not to do this study. Even if you start the study, you can stop at any time.

If you decide to be in the study I will not tell anyone else how you respond or act as part of the study. Even if your parents or anyone else asks, I will not tell them about what you say or do in the study.

Signing here means that you have read this form or have had it read to you and that you are willing to be in this study.

Signature of participant ______________________________

Participant's printed name ______________________________

Signature of investigator______________________________

Date____________________

ASU IRB
Approved
Sign SM
Date 11/10/09 - 11/6/10

'La Comida Paraguaya': Perspectivas Culturales de la Economía del Mercado y Hogar
Universidad Estatal de Arizona
FORMULARIO DE CONSENTIMIENTO (NIÑO DE 6-12 AÑOS)

Mi nombre es Meredith "Luisa" Gartin. Yo trabajo en la Universidad Estatal de Arizona.

Estoy solicitando tu participación en esta investigación porque yo procuro aprender más sobre la salud y la nutrición. Yo quiero aprender sobre las clases de comida que los chicos comen. Tus padres han dado permiso para que participes en este estudio.

Si estas de acuerdo, yo te preguntaré acerca de cuántas veces comiste una lista de comida. También pediré saber tu altura y tu peso. Contestar estas preguntas tomará cerca de 30 minutos. Tus padres estarán en esta habitación o acerca de vos. No necesita poner tu nombre en la encuesta. No tienes que contestar preguntas que te hagan sentir incómodo/a.

No tienes que participar en este estudio. Nadie se enojará si decides no participar. Aún si empiezas este estudio, puedes dejar de participar en cualquier momento.

Si decides estar en este estudio, no le diré a nadie cómo tus contestas o actúas como parte del estudio. Aún si tus padres o cualquier otra persona preguntan, yo no les diré sobre los que digas o hagas en el estudio.

Al firmar aquí abajo significa que haz leído este formulario o que una persona te lo leyó y que estas dispuesto/a a participar en este estudio.

Firma de Participante ______________________________

Nombre de Participante ______________________________

Firma de Investigador ______________________________

Fecha__________________

ASU IRB
Approved
Sign SM
Date 11909 - 11110

'La Comida Paraguaya': Cultural Perspectives of the Market and Household Economy
Arizona State University
ASSENT FORM (CHILD AGE 13-17)

My name is Meredith Gartin. I work at Arizona State University.

I am asking you to take part in a research study because I am trying to learn more about health and nutrition. I want to learn about the types of foods kids your age eats and how you feel. Your parent(s) have given you permission to participate in this study.

If you agree, you will be asked to fill out a survey about how often you've eaten a list of food items and how you've felt in the last week. You will be asked to provide your height and weight. Answering these questions will take about 30 minutes, and your parent(s) will be in the room or nearby. You do not have to put your name on the survey. You do not have to answer any questions that make you uncomfortable.

You do not have to be in this study. No one will be mad at you if you decide not to do this study. Even if you start the study, you can stop at any time.

If you decide to be in the study I will not tell anyone else how you respond or act as part of the study. Even if your parents or anyone else asks, I will not tell them about what you say or do in the study.

Signing here means that you have read this form or have had it read to you and that you are willing to be in this study.

Signature of participant ____________________

Participant's printed name ____________________

Signature of investigator____________________

Date____________________

ASU IRB
Approved
Sign Sm
Date 111909 - 111810

'La Comida Paraguaya': Perspectivas Culturales de la Economía del Mercado y Hogar
Universidad Estatal de Arizona
FORMULARIO DE CONSENTIMIENTO (NIÑO DE 13-17 AÑOS)

Mi nombre es Meredith "Luisa" Gartin. Yo trabajo en la Universidad Estatal de Arizona.

Estoy solicitando tu participación en esta investigación porque yo procuro aprender más sobre la salud y la nutrición. Yo quiero aprender sobre las clases de comida que los chicos comen y cómo se sienten. Tus padres me dieron permiso para que participes en este estudio.

Si tú estas de acuerdo, yo te preguntaré acerca de cuántas veces comiste una lista de comida y sobre tu estado de ánimo (cómo te sentiste) la semana pasada. También pediré saber tu altura y tu peso. Tomará unos 30 minutos contestar estas preguntas. Tus padres estarán en esta habitación o acerca de vos. No necesita poner tu nombre en la encuesta. No tienes que contestar preguntas que te hagan sentir incómodo/a.

No tienes que participar en este estudio. Nadie se enojará si decides no participar. Aún si empiezas este estudio, puedes dejar de participar en cualquier momento.

Si decides estar en este estudio, no le diré a nadie cómo tus contestas o actúas como parte del estudio. Aún si tus padres o cualquier otra persona preguntan, yo no les diré sobre los que digas o hagas en el estudio.

Al firmar aquí abajo significa que haz leído este formulario o que una persona te lo leyó y que estas dispuesto/a a participar en este estudio.

Firma de Participante ____

Nombre de Participante ____

Firma de Investigador ____

Fecha___________________________

ASU IRB
Approved
Sign SM
Date 111909 - 111810

'La Comida Paraguaya': Cultural Perspectives of the Market and Household Economy
Arizona State University
CONSENT FORM (18 Years and older)

INTRODUCTION
The purposes of this form are to provide you (as a prospective research study participant) information that may affect your decision as to whether or not to participate in this research and to record the consent of those who agree to be involved in the study.

RESEARCHERS
Dr. Alexandra Brewis Slade and Ms. Meredith Gartin, College of Liberal Arts, School of Human Evolution and Social Change, Arizona State University, have invited your participation in a research study.

STUDY PURPOSE
The purpose of the research is to understand how food is obtained for the family and how different households decide to cook, prepare, share, and buy healthy food. This information can be used to help design better community facilities and interventions, such as distribution of information about better quality diets.

DESCRIPTION OF RESEARCH STUDY
You have been asked to participate in this study because you live in the *Barrio* ____________________, where we are currently conducting the study. Approximately 114 families are participating in the study. The selection of the households is at random to protect your identity. (We have a map of the barrio, and we drew lines on a map randomly. Then, we select a, for example 10, and we count for every 10th house on each line to be included in this study).

If you decide to participate, then we will select the primary food preparer or household cook to do the following: complete an interview in your home about your historical background, about your diet, and how you obtain food used for cooking for all the members of your household. Also, each person in this household will be selected to complete a survey about the foods that they eat and how they feel (their emotional state), and also, I will measure their height and weight. To complete these interviews it will take approximately an hour to 2 hours, and the surveys will take approximately 20-30 minutes to complete. Larger households will take more time.

RISKS
We do not foresee any risks associated with participating in this research. As with any research, there is some possibility that you may be subject to risks that have not yet been identified. If you feel uncomfortable at any state of the interview, you can ask us to stop.

BENEFITS
Although there may be no direct benefits to you or your child, the possible benefits of your participation in the research are that others might benefit from improvements in dietary health problems and problems accessing food. We will share the results of this study with our community partners, who provide child health services and facilities and amenities to this community.

CONFIDENTIALITY
All information obtained in this study is strictly confidential. The results of this research study may be used in reports, presentations, and publications, but the researchers will not identify you, and no information about you or your participation will be released. In order to maintain confidentiality of your records, Meredith Gartin will use codes on all data forms, which will not be linked to your name. All information obtained in interviews will be kept secure in a locker with Mrs. Meredith. All audio interviews will be deleted after they are transcribed. Any names given during the interviews will be deleted from all transcriptions, or given a code for their relationship to you.

WITHDRAWAL PRIVILEGE

ASU IRB
Approved
Sign SM
Date 11909- 11810

Participation in this study is completely voluntary. It is ok for you to say no. Even if you say yes now, you are free to say no later, and withdraw from the study at any time before data collection is complete.

COSTS AND PAYMENTS

The researchers want your decision about participating in the study to be absolutely voluntary.
Yet they recognize that your participation may pose some inconvenience because of the time it takes to complete. There is no payment for your participation in this study, but we will provide you with a modest gift as a thank you for participating, whether or not you and your child complete the interview.

VOLUNTARY CONSENT

Any questions you have concerning the research study or your participation in the study, before or after your consent, will be answered by **Alexandra Brewis Slade**, School of Human Evolution and Social Change, Arizona State University, Tempe, AZ 83287-2402. Tel: (0021) 480-727-9879, or **Meredith Gartin**, School of Human Evolution and Social Change, Arizona State University, Tempe, AZ 83287-2402. Tel: (595) 0984 524 586. If you have questions about your rights as a subject/participant in this research, or if you feel you have been placed at risk; you can contact the Chair of the Human Subjects Institutional Review Board, through the ASU Office of Research Integrity and Assurance, at (0021) 480-965 6788.

This form explains the nature, demands, benefits and any risk of the project. By signing this form you agree knowingly to assume any risks involved. Remember, your participation is voluntary. You may choose not to participate or to withdraw your consent and discontinue participation at any time without penalty or loss of benefit. In signing this consent form, you are not waiving any legal claims, rights, or remedies. A copy of this consent form will be given offered to you.

Your signature below indicates that you consent to participate in the above study.

______________________	______________________	__________
Subject's Signature	Printed Name	Date
______________________	______________________	__________
Other Signature (if applicable)	Printed Name	Date

INVESTIGATOR'S STATEMENT

"I certify that I have explained to the above individual the nature and purpose, the potential benefits and possible risks associated with participation in this research study, have answered any questions that have been raised, and have witnessed the above signature. These elements of Informed Consent conform to the Assurance given by Arizona State University to the Office for Human Research Protections to protect the rights of human subjects. I have provided (offered) the subject/participant a copy of this signed consent document."

Signature of Investigator______________________________ Date___________

La Comida Paraguaya: Perspectivas Culturales de las Economías del Mercado y el Hogar
Universidad Estatal de Arizona
FORMULARIO DE CONSENTIMIENTO (MAYOR DE 18 AÑOS)

INTRODUCCIÓN
El propósito de este formulario es proveerle a usted (tal vez un futuro participante de este estudio) información que puede afectar su decisión sobre participar o no participar en este estudio, y para registrar el consentimiento de las personas que estén de acuerdo en participar en el estudio.

ESPECIALISTAS
La Profesora Alexandra Brewis Slade y la Sra. Meredith "Luisa" Gartin del Colegio de Artes y Ciencias de la Universidad Estatal de Arizona, y sus colegas les invitan a participar en este estudio.

PROPÓSITO DEL ESTUDIO
El propósito del estudio es aprender cómo diferentes hogares obtienen la comida a través de (por) la familia y deciden cocinar, preparar, compartir, y comprar alimentos. Esta información puede ayudar en el diseño de mejores intervenciones en su comunidad, tales como la difusión de información sobre cómo alimentarnos mejor.

DESCRIPCIÓN DEL ESTUDIO
Se la ha pedido su participación en el estudio porque usted vive dentro del barrio _______________, donde actualmente estamos llevando acabo el estudio. Cerca de 114 familias están participando en el estudio. La selección de los hogares es al azar para proteger su identidad (Tenemos un mapa del barrio y dibujamos las líneas en el mapa al azar. Entonces, seleccionamos una numero, por ejemplo 10, y contamos para que cada 10ma casa en cada línea esté incluída en este estudio).

Si usted decide participar, entonces se le pedirá a la persona que hace las compras o que prepara las comidas en su casa, que haga lo siguiente: completar una entrevista en su casa sobre su historial demográfico, sobre su dieta, y cómo obtiene los alimentos para cocinar la comida por los miembros de la familia. También, se le pedirá a cada persona en este hogar que complete una encuesta sobre las comidas que comen y sobre su estado de ánimo, y también tomaré sus medidas de estatura y peso. Completar la entervista tomará aproximadamente unos 60 a 120 minutos, y las encuestas tomarán aproximadamente una 20 a 30 minutos para completar. Hogares más grandes tomarán más tiempo.

RIESGOS
No anticipamos ningún riesgo asociado con su participación en este estudio. Como con cualquier estudio, hay alguna posibilidad que usted sea sometida/o a riesgos que hasta el momento no hayan sido identificados. Si usted se siente incómoda/o en cualquier etapa de la entrevista, usted puede pedir que pongamos fin a lo que estemos haciendo.

BENEFICIOS
Aunque tal vez no haya beneficios directos para usted, los posibles beneficios de su participación en el estudio son que tal vez otros se puedan beneficiar de hacer mejores programas de dietas saludables. Nosotros compartiremos los resultados de este estudio con nuestros compañeros en la comunidad los cuales proveen servicios para la salud de los niños y otros servicios a esta comunidad.

CONFIDENCIALIDAD
Toda la información obtenida en este estudio es estrictamente confidencial al menos que la tengamos que dar si la ley la requiere. Los resultados de este estudio se pueden usar en reportes, presentaciones y publicaciones, pero el equipo del estudio no lo identificará a usted y ninguna información sobre usted o su participación será hecha pública. Para proteger su confidencialidad y los datos, Meredith "Luisa" Gartin usaré códigos en todos los formas de datos, cual no llevaría su nombre. Toda la información en este estudio será guardada en un armario con la Sra. Meredith. Toda la información en audio se transcribiría y los nombres que se digan en la entrevista serán borrados o se indicará con un código la relación de ese nombre al entrvistado/a. Después de transcribir la entrevista, los audios se borrarán.

ASU IRB
Sign SM Approved
Date 11/9/09 - 11/8/10

PRIVILEGIO DE DEJAR DE PARTICIPAR
Está bien si usted decide no participar. Aunque usted diga que sí ahorita, usted tiene la libertad de decidir no seguir participando y dejar de participar en cualquier momento antes de terminar de recoger sus datos.

COSTOS Y PAGOS
Los especialistas del estudio quieren que su decisión de participar en este estudio sea absolutamente voluntaria. Sin embargo reconocen que su participación puede ser un poco inconveniente por el tiempo que se llevara en completar la entrevista. No hay ningún pago por su participación en el estudio pero sí le daremos un regalo modesto en agradecimiento por su participación si termina la entrevista, y aunque no la termine.

CONSENTIMIENTO VOLUNTARIO
Cualquier pregunta que usted tenga acerca de este estudio o sobre su participación en el estudio, antes o después de dar su consentimiento, será contestada por la profesora **Alexandra Brewis Slade,** la Escuela de Evolución Humana y Cambio Social de la Universidad Estatal de Arizona. Tempe, AZ 83287--2402. Tel: (0021) 480-727-9879, o **Meredith "Luisa" Gartin** de la Escuela Evolución Humana y Cambio Social de la Universidad Estatal de Arizona. Tempe, AZ 83287--2402. Tel: (595) 0984 524 586. Si usted tiene preguntas sobre sus derechos como participante en este estudio, o si piensa que usted ha sido puesto en riesgo, puede comunicarse con el director del Human Subjects Institutional Review Board, a través del ASU Office of Research Integrity and Assurance, al teléfono (0021) 480-965 6788.

Este formulario explica la naturaleza, la demanda, los beneficios y el riesgo del proyecto/estudio. Al firmar este formulario usted da su consentimiento reconociendo y asumiendo los riesgos involucrados. Recuerde que su participación es voluntaria. Usted puede decidir no participar o retirar su consentimiento y dejar de participar en cualquier momento sin ninguna consecuencia o pérdida de beneficios. Al firmar este consentimiento usted no está renunciando a ningún reclamo, derecho o enmienda legal. Se le ofrecerá una copia de este formulario para que usted la tenga como comprobante.

Al firmar en el espacio de abajo usted da su consentimiento de participar en este estudio.

____________________	____________________	__________
Firma del participante	Nombre del participante	Fecha
____________________	____________________	__________
Otra firma (si es apropiada)	Nombre	Fecha

DECLARACIÓN DEL ESPECIALISTA

Certifico que le he explicado a la persona mencionada anteriormente la naturaleza y el propósito, los beneficios potenciales y los posibles riesgos asociados con su participación en este estudio. He contestado las preguntas que me han hecho y he sido testigo de la firma de esta persona. Estos elementos del formulario del Consentimiento Informado están de acuerdo con las reglas de Garantía escritas por la Universidad Estatal de Arizona y las que sigue la Office for Human Research Protections para proteger los derechos de participantes humanos. Le he ofrecido al participante una copia de este formulario de consentimiento firmado por ambos.

Firma del Especialista______________________________ Fecha__________

ARIZONA STATE UNIVERSITY
RESEARCH AND ECONOMIC AFFAIRS

Office of Research Integrity and Assurance

To:	Alexandra Brewis ANTH
for **From:**	Mark Roosa, Chair SM Soc Beh IRB
Date:	04/02/2010
Committee Action:	**Amendment to Approved Protocol**
Approval Date:	04/02/2010
Review Type:	Expedited F12
IRB Protocol #:	0911004527
Study Title:	La Comida Paraguaya: Perspectivas Culturales de Economias del Mercado y el Hogar
Expiration Date:	11/18/2010

The amendment to the above-referenced protocol has been APPROVED following Expedited Review by the Institutional Review Board. This approval does not replace any departmental or other approvals that may be required. It is the Principal Investigator's responsibility to obtain review and continued approval of ongoing research before the expiration noted above. Please allow sufficient time for reapproval. Research activity of any sort may not continue beyond the expiration date without committee approval. Failure to receive approval for continuation before the expiration date will result in the automatic suspension of the approval of this protocol on the expiration date. Information collected following suspension is unapproved research and cannot be reported or published as research data. If you do not wish continued approval, please notify the Committee of the study termination.

This approval by the Soc Beh IRB does not replace or supersede any departmental or oversight committee review that may be required by institutional policy.

Adverse Reactions: If any untoward incidents or severe reactions should develop as a result of this study, you are required to notify the Soc Beh IRB immediately. If necessary a member of the IRB will be assigned to look into the matter. If the problem is serious, approval may be withdrawn pending IRB review.

Amendments: If you wish to change any aspect of this study, such as the procedures, the consent forms, or the investigators, please communicate your requested changes to the Soc Beh IRB. The new procedure is not to be initiated until the IRB approval has been given.

Please retain a copy of this letter with your approved protocol.

Arizona State University
Office of Research Integrity and Assurance
IRB
P.O. Box 871103
Tempe, AZ 85287-1103
Phone: 480-965-6788
Fax: (480) 965-7772

ASU

For Office Use Only:
Date Received:

Modification Form Institutional Review Board (IRB)

INVESTIGATOR INFORMATION	
PROTOCOL TITLE: La Comida Paraguaya: Perspectiva Culturales de las Economías del Mercado y Hogar	**HS # 0911004527**
PRINCIPAL INVESTIGATOR: Alexandra A Brewis (Slade)	**DEPARTMENT/ CENTER: SHESC -2402**
CAMPUS ADDRESS: School of Human Evolution and Social Change, Arizona State University. Tempe, AZ 83287-2402	**PHONE: 480-727-9879** **EMAIL: alex.brewis@asu.edu**
CO-INVESTIGATORS: Meredith Gartin	

FUNDING STATUS:
If project is funded or funding is being sought, provide list of all sponsors and grant numbers:
(1) ASU Graduate Research Support Program, 2009 Research Grant Competition (awarded)
ID: Research 10.1292; Title: Feeling Certain in a Food Insecure System
(2) The Wenner-Gren Foundation (pending)
ID: 35694; Title: Doctoral Dissertation Research: Food Security and Emotional Uncertainty: A Study of a Paraguayan Food Desert
(3) National Science Foundation, Cultural Anthropology (pending)
ID:1026406; Title: Doctoral Dissertation Research: Feeling Certain in a Food Insecure Environment: A Study of an Urban Paraguayan Food Desert

TYPE OF MODIFICATION (CHECK ALL THAT APPLY)
Please attach any revised documents (forms, scripts, etc). Attach a brief summary of the proposed changes as well as a justification.

☐	New Procedures	Attach a description of the new procedures and a revised consent form.
☐	Study Title Change	What is the new title?
☐	Change in Study Personnel	☐ Add (include the name, role, and contact information. Include copies of training certificates: http://researchintegrity.asu.edu/training/humans ☐ Delete
☐	Change of Site	☐ Add (include the name and location. If this changes the enrollment, that should be noted below.) ☐ Modify ☐ Delete
☒	Change in Enrollment	Attach a narrative justifying the change. If this will affect the consent, send a revised consent form as well. During the Phase I, pilot, we found that parents did not want to include their children age 6 (our base age) to participate because they felt they are too young. However, parents agreed to allow their children ages 7 and older. Therefore, we wish to change the ages for children. We will only recruit children age 7-17.
☒	Consent Change	Attach a copy and describe the change(s). The age categories have changed for enrolling children into the study. Therefore, there are changes in each consent form that represent this change in age categories. In addition, we plan to use a different instrument for the child anxiety/depression scale (explanation in instrument

Revision 05/09

		section). It is a validated tool that includes children ages 7-17. Our original form and instruments enrolled children with 13-17 years into the study with an anxiety/depression questions. However, with the introduction of the new scales and elimination of the children age 6, we do not need to change the text of the forms, only the age groups.
☐	Advertisement	Attach copies of the advertisement or announcement.
☒	Instruments (surveys, questionnaires, interviews, etc)	Attach copies of the proposed instruments and describe any changes from the approved protocol. If you are adding or deleting any instruments or items to an instrument, describe what the changes are and submit the revised materials. The following instruments that have been modified with respect to our observations in Phase I, pilot: (1) Food Frequency Questionnaire (Encuesta: FFQ – Comida Paraguaya). During Phase I, pilot, we found some of the food items needed clarification because the Spanish was too formal. Therefore, we have changed some of the original items to words that are in line with the local dialect. The following provides the original term → modified term (highlighted in green on the form): a. Cerdo → Chancho b. Potato Chips → Galletita c. Yerba de dulce → Caña de azúcar d. No jugo, solo fruta → Fruta e. Tomatillos → Tomates f. Salsas de crema o queso → Salsas Blanca g. Tomatillos → Tomates h. Chayotes → Zapallo i. Frijoles → Poroto, Legumbres j. Guisantes → Arbejas The following items were recommended by Phase I, pilot participants to add to the instrument. These are other common foods that were not included in our original form (highlighted in yellow). a. Yogur b. Carpincho c. Menudencias o Mondongo d. Mbeju e. Pajagua Maskada f. Croquetes g. Lomito h. Pastel Mandi'o i. Panchos j. Arroz k. Ensalada de arroz o papa l. Ensalada de fruta m. Pororó n. Aloja o. Lechuga – berro p. Pepino q. Miel de abeja r. ¿Qué tan seguido usa ketchup? (2) Información del Hogar (household roster and survey). The roster is the same, but the coding key has been removed to a separate sheet for the participants to review when we ask them the

		questions. We added the household survey to this form and we code how many of each item a household owns/has. From our observations in Phase I, pilot, the following items have been added: a. No. de aire acondicionado (Number of air conditioners) b. No. de equipos de sonido (Number of sound stereos) c. No. de computadoras (Number of computers) d. Línea baja o/y internet (Land telephone line or internet service) e. No. de heladeras (Number of freezers) f. No. de chanchos (Number of pigs) g. Basero c/carbón (grill coal stove) h. Kincho c/Madera (grill wood stove) i. Parrilla (Barbeque grill) j. Cocina, electrico o gas (Gas or electric stove top cooker) k. Microondas (microwave) In addition, we took the first questions in our interview guide and made them open ended questions on this form. This makes more sense because they are related to the household history/demographics. By making these changes, we are able to keep all the household information on one form. (3) Guia de Entrevista. During Phase I, pilot, we found that there are two separate household roles: the food preparer and the food shopper. We have divided the interview into two parts. If only one person attends to this role, they will be asked all the questions, but this has not been observed (minus Question II.a.). The questions remain the same, but have been reordered. Some questions were deleted from the protocol and replaced with the first question in each interview part: "What is your daily, weekly, week-end routing?" This question allows for more description in household roles and the items that were deleted sort in the answers given by this question. Because the question is addresses the day, rather than a task, we are able to obtain more variation in the participants' answers. For question, I.b., we added items, iv., v., vi. During our pilot interviews, we found it was easier to understand where people shopped if we had them describe their grocery list. We also found this question indicates level of insecurity for participants in their food shopping goals. A few participants discussed, ofertas or coupon sales. Therefore, we added a question about this topic as well. Some participants discussed having medical treatment for nutrition-related illnesses. Therefore, we decided to include a question that directly asks about this topic. Question, II.f. is about discussing healthy food with a professional.

		The questions in yellow highlights have been added from our observations in Phase I (The English translation is given with the Spanish for the additions). Three questions were re-worded to include more local vocabulary and idioms. The following changes were made (and are highlighted in green): a. In question, II.B.iii. 'ya cocinada o hecho' is used instead of 'comidas preparadas o comida para llevar' b. In question, C. and C.i. we use 'huerta' instead of 'jardin'. c. The Spanish for questions, I.e. and II.g. are reworded. The original question was too direct, "¿Había un tiempo cuando Ud. pensó que no iba a poder comprar u obtener los alimentos necesarios para su familia?". We find the new wording to be less direct and poses less blame for the participant. The wording now addresses the event of food insecurity rather than the person who is food insecure, and the person can remain more anonymous. During Phase I, pilot we found that the depression/anxiety scale (HSCL) is best used with adults. Therefore, we propose to add the two following scales designed specifically for children ages 7-17. They are validated, Spanish tools. The instruments are: (1) Encuesta: RCMAS (Revised Children's Manifest Anxiety Scale) (2) Encuesta: CDI (Children's Depression Inventory)
		Describe the changes. If this affects the consent process, submit a revised consent form.

SIGNATURE	
PRINCIPAL INVESTIGATOR:	Name (first, middle, last): Alexandra A Brewis
	Signature: [signature] Date: March 30, 2010

ASU IRB
Approved
Sig [signature]
Date 4 D 40

PAGE 4

'La Comida Paraguaya': Cultural Perspectives of the Market and Household Economy
PARENTAL LETTER OF PERMISSION

Dear Parent:

I am a graduate student of Professor Alexandra Brewis in the School of Human Evolution and Social Change at Arizona State University. I am conducting a research study to understand how different household obtain food for the family and how they decide to cook, prepare, share, and buy healthy food.

I am inviting your child's participation (7-17 years old), which will involve a survey about the foods that they have eaten in the past month, will take measurements of their height and weight, and they will also complete a survey about how their emotional state. To complete these surveys, it will take approximately 20-30 minutes. Your child's participation in this study is voluntary. If you choose not to have your child participate or to withdraw your child from the study at any time, there will be no penalty. Likewise, if your child chooses not to participate or to withdraw from the study at any time, there will be no penalty. The results of the research study may be published, but your child's name will not be used.

Although there may be no direct benefit to your child, the possible benefits of your child's participation are improvements in dietary health problems and problems in accessing food. There are no foreseeable risks or discomforts to your child's participation.

All information in this study is confidential. In order to maintain confidentiality of your records, Meredith Gartin will use codes on all data forms, which will not be linked to your name. The results of this study may be used in reports, presentations, or publications but your child's name will not be used. Results will only be shared in the aggregate form.

If you have any questions concerning the research study or your child's participation in this study, please call me at (595) 0984 524 586 or Dr. Alexandra Brewis Slade at (0021 - 480) 727-9879.

Sincerely,

Meredith 'Luisa' Gartin

By signing below, you are giving consent for your child _______________ (Child's name) to participate in the above study.

_____________________ _____________________ _____
Signature Printed Name Date

If you have any questions about you or your child's rights as a subject/participant in this research, or if you feel you or your child have been placed at risk, you can contact the Chair of the Human Subjects Institutional Review Board, through the Office of Research Integrity and Assurance, at (480) 965-6788.

ASU IRB
Approved
Sign Sm
Date 4-20-10 - 11/6/10

PAGE 2

'La Comida Paraguaya': Perspectivas Culturales de la Economía del Mercado y Hogar
LA CARTA DE PERMISO DE LOS PADRES

Estimado Padre de Familia:

Soy una estudiante de doctorado de la Profesora Alexandra Brewis en la Escuela de Evolución Humana y Cambio Social de la Universidad Estatal de Arizona. Estoy dirigiendo una investigación para aprender cómo diferentes hogares obtienen la comida a través de la familia y cómo deciden cocinar, preparar, compartir, y comprar alimentos.

Estoy solicitando la participación de su niño/a (7 a 17 años), cual incluirá una encuesta sobre las comidas que han comido en el mes pasado, tomaré sus medidas de estatura y peso, y completará una encuesta sobre su estado de ánimo. Para completar estas encuestas, tomará aproximadamente unos 20 a 30 minutos. La participación de su niño/a en este estudio es voluntaria. Si Ud. decide que no quiere que su niño/a participe o dejar el estudio en cualquier momento, no habrá penalidad. Lo mismo, si su niño/a elige que no participar o dejar el estudio en cualquier momento, no habrá penalidad. Los resultados del estudio serán publicados, pero el nombre de su niño/a no será utilizado.

Aunque tal vez no haya beneficios directos para usted, los posibles beneficios de su participación en el estudio son que tal vez otros se puedan beneficiar de hacer mejores programas de dietas saludables. No hay riesgo o incomodidades que anticipemos en la participación de su niño/a.

Toda la información en este estudio es confidencial. Para mantener confidencialidad de sus datos, Meredith 'Luisa' Gartin usará códigos en todas las formas de datos, cual no llevaría su nombre o el nombre de su niño/a. Los resultados de este estudio se pueden usar en reportes, presentaciones y publicaciones, pero el nombre de su niño/a no se usará. Los resultados solo se compartiran de manera agregada.

Si tiene cualquier pregunta acerca de este estudio o la participación de su niño/a en este estudio, por favor, llámame a (595) 0984 534 586 o llama a Dra. Alexandra Brewis Slade (0021 -480) 727-9879.

Sinceramente,

Meredith 'Luisa' Gartin

Al firmar en el espacio de abajo usted da su consentimiento para que su niño/a
__________________________ (el nombre del (la) niño/a) participe en este estudio.

Firma Nombre Fecha

Si usted tiene preguntas sobre sus o sus niño/a derechos como participante en este estudio, o si piensa que usted o su niño/a ha sido puesto en riesgo, puede comunicarse con el director del Human Subjects Institutional Review Board, a través del ASU Office of Research Integrity and Assurance, al teléfono (0021) 480-965 6788.

ASU IRB
Approved
Sign Sm
Date 4D210 - 11181J

PAGE 6

'La Comida Paraguaya': Cultural Perspectives of the Market and Household Economy
Arizona State University
ASSENT FORM (CHILD AGE 7-17)

My name is Meredith Gartin. I work at Arizona State University.

I am asking you to take part in a research study because I am trying to learn more about health and nutrition. I want to learn about the types of foods kids your age eats and how you feel. Your parent(s) have given you permission to participate in this study.

If you agree, you will be asked to fill out a survey about how often you've eaten a list of food items and how you've felt in the last week. You will be asked to provide your height and weight. Answering these questions will take about 30 minutes, and your parent(s) will be in the room or nearby. You do not have to put your name on the survey. You do not have to answer any questions that make you uncomfortable.

You do not have to be in this study. No one will be mad at you if you decide not to do this study. Even if you start the study, you can stop at any time.

If you decide to be in the study I will not tell anyone else how you respond or act as part of the study. Even if your parents or anyone else asks, I will not tell them about what you say or do in the study.

Signing here means that you have read this form or have had it read to you and that you are willing to be in this study.

Signature of participant ______________________________

Participant's printed name ______________________________

Signature of investigator______________________________

Date____________________

ASU IRB
Approved
Sign SM
Date 4 20 10 - 11 8 10

'La Comida Paraguaya': Perspectivas Culturales de la Economía del Mercado y Hogar
Universidad Estatal de Arizona
FORMULARIO DE CONSENTIMIENTO (NIÑO DE 7-17 AÑOS)

Mi nombre es Meredith "Luisa" Gartin. Yo trabajo en la Universidad Estatal de Arizona.

Estoy solicitando tu participación en esta investigación porque yo procuro aprender más sobre la salud y la nutrición. Yo quiero aprender sobre las clases de comida que los chicos comen y cómo se sienten. Tus padres me dieron permiso para que participes en este estudio.

Si tú estas de acuerdo, yo te preguntaré acerca de cuántas veces comiste una lista de comida y sobre tu estado de ánimo (cómo te sentiste) la semana pasada. También pediré saber tu altura y tu peso. Tomará unos 30 minutos contestar estas preguntas. Tus padres estarán en esta habitación o acerca de vos. No necesita poner tu nombre en la encuesta. No tienes que contestar preguntas que te hagan sentir incómodo/a.

No tienes que participar en este estudio. Nadie se enojará si decides no participar. Aún si empiezas este estudio, puedes dejar de participar en cualquier momento.

Si decides estar en este estudio, no le diré a nadie cómo tus contestas o actúas como parte del estudio. Aún si tus padres o cualquier otra persona preguntan, yo no les diré sobre los que digas o hagas en el estudio.

Al firmar aquí abajo significa que ha leído este formulario o que una persona te lo leyó y que estas dispuesto/a a participar en este estudio.

Firma de Participante ______________________________

Nombre de Participante ______________________________

Firma de Investigador ______________________________

Fecha____________________

ASU IRB
Approved
Sign SM
Date 4026/10 - 11/8/10

Household Information

Make a list of all the people in this house that share or cook food with you and give their demographics.

ID	gender	Age	Birthplace	Relation	Education	Occupation	PR/PU/I	Monthly income	Cook	shopper
HG001				HHLD HEAD						
HG002										
HG003										
HG004										
HG005										
HG006										
HG007										
HG008										
HG009										
HG010										
HG011										
HG012										
HG013										
HG014										
HG015										
HG016										
HG017										

How many years has this family lived in San Lorenzo? ____________ years. How long have you lived in this house? ____________ months or years

What are some of the advantages living in San Lorenzo? ____________________

____

What are some of the disadvantages living in San Lorenzo? ____________________

____

Why did you and this family come to move to San Lorenzo? ____________________

Household ID [| | | |]

INVESTIGATOR INITIALS [|]

INTERVIEW DATE [|] / [|] / 2010
day month

Indicate which things work in the house

Electricity	
Number of Water Sources	
Number of sanitation facilities	
Flooring material	
Wall material	
Roof material	
Number of bedrooms	
Number of airconditioners	
Number of automóviles	
Number of motorbikes	
Number of bicycles	
Number of televisions	
Number of radios	
Number of sound stereos	
Number of cell phones	
Store in home	
Number of computers	
Land telephone line/internet	
Tatacuá (traditional oven)	
Oven	
Number of Refrigerators	
Number of sinks	
Number of freezers	
Number of chickens	
Number of cows	
Number of pigs	
Carbon grill stove	
Wood grill stove	
Barbque grill	
Stove top (electric/gas)	
Microwaves	

PAGE 1

INFORMACIÓN DEL HOGAR

Hace una lista de todas personas en esta casa que comparta o cocine comida con usted y da sus demográficas.

ID	género	edad	lugar de nacimiento	relación	educación	Ocupación	PR/PU/I	salario/ mes	Cocinero/a	Comprador -a
HG001				HHLD HEAD						
HG002										
HG003										
HG004										
HG005										
HG006										
HG007										
HG008										
HG009										
HG010										
HG011										
HG012										
HG013										
HG014										
HG015										
HG016										
HG017										

¿Cuántos años vive la familia en San Lorenzo? ____________ años. ¿Por cuánto tiempo ha vivido la familia en este hogar? ____________ meses o años

¿Cuáles son las ventajas de vivir en San Lorenzo? ____

____

¿Cuáles son las desventajas de vivir en San Lorenzo? ____

____

¿Por qué vinieron a vivir su familia a San Lorenzo? ____

PAGE 1

HOGAR ID ☐☐☐☐☐

INVESTIGADORA INCIALES ☐☐

FECHA DE ENTREVISTA ☐☐ / ☐☐ / 2010
Día Mes

Indica cual cosas funcionan en este hogar

Electricidad	
No. de tipos de agua	
No. de facilidades del sanitario	
Material del piso	
Material del muro	
Material del techo	
No. de dormitorios	
No. de aire acondicionado	
No. de automóviles	
No. de motos	
No. de bicicletas	
No. de televisiones	
No. de radio	
No. de equipos de sonido	
No. de celulares	
Tienda en la casa	
No. de computadoras	
Línea baja o/y internet	
Tatacuá	
Horno	
No. de fregaderos	
No. de heladeras	
No. de congeladores	
No. de pollos o gallinas	
No. de vacas	
No. de chanchos	
Brasero (c/ carbón)	
Kincho (c/ madera)	
Parrilla	
Cocina (eléctrico o gas)	
Microondas	

Codes

HHLD HEAD = The person in the household that pays the bills and makes the economic decisions for the family.

Gender:
M = Male
F = Female

Relation:
1 = Spouse
2 = Partner
3 = Biological child
4 = Stepchild
5 = Adopted Child
6 = Child of Partner
7 = Son-in-law, daughter-in-law
8 = Parent
9 = Step parent
10 = Parent-in-law
11 = Grandparent
12 = Sibling
13 = Step-Sibling
14 = Half-Sibling
15 = Brother-in-law, Sister-in-law
16 = Grandchild
17 = Uncle, Aunt
18 = Nephew, Niece
19 = Other Relative (specify)
20 = Friend
21 =Other (specify)
97 = No answer, refused
98 = I don't know

Education:
1 = Primary School
2 = Secondary School
3 = High School
4 = University
* Left School
# Private School
+ Taking English Classes

Occupation:
PR = Private
PU = Public
I = Independent

Códigos

HHLD HEAD = La persona en el hogar que paga las facturas o hace decisiones económica por la familia.

Género:
M = Masculino
F = Femenino

Relación:
1 = Esposo/a
2 = Novio/a
3 = Hijo/a
4 = Hijastro/a
5 = Hijo/a adoptivo/a
6 = Hijo/a de Novio/a
7 = Yerno o Nuera
8 = Padre/Madre
9 = Padrastro/Madrastra
10 = Suegro/a
11 = Abuelo/a
12 = Hermano/a
13 = Hermanastro/a
14 = Medio/a Hermano/a
15 = Cuñado/a
16 = Nieto/a
17 = Tío/a
18 = Sobrino/a
19 = Otro Parientes (especificar)
20 = Amigo/a
21 = Otro (especificar)
97 = No contesta
98 = No sé

Educación:
1 = Primaria
2 = Secundaria
3 = Preparatoria
4 = Universidad
* No terminó
# Escuela privada
+ En clases privada de ingles

Ocupación:
PR = Privada
PU = Publica
I = Independiente

HOUSEHOLD ID [| | | |]

SURVEY: FFQ – COMIDA PARAGUAYA

LINE ID: HG0 [|]

INVESTIGATOR INCIALS [|]   OTHER INVESTIGATOR [|]   INTERVIEW DATE [|] / [|] / 2010
Day Month

Thinking about your (this child's) eating habits during the past month, which of the following foods have you eaten in your house or in restaurants?

	Once a month or less	2-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Every day	No answer	I don't know
Eggs								
Milk								
Yogurt								
Beef								
Chicken								
Sausage								
Fish								
Pig								
Rabbit								
Carpincho								
Asado								
Menudencias o Mondongo								
Mbeju								
Pajagua Maskada								
Hamburgers								
Chicken, Beef, or Chileno Croquetes or Empanadas								
Milanesa								
Lomito								
Pastel Mandi'o								
Tortillas								
Hot Dogs								
Sopa Paraguaya								
Chipa								
Chicken or Beef Sandwhich								
Vegetable Sandwich (with eggs)								
Ham and Cheese Sandwhich								
Pizza								
Rice or Pasta (with Beef or Chicken)								
Vegetable Soup with Chicken or Beef								
French Fries								
Bread								
Manioc								
Lettuce Salad with Onions and Tomotaes								
Rice or Potato Salad								
Fruit Salad								
Peanuts, Popcorn, Chips								
Chipitas or Cookies								
Sugar Cane								

Cakes or Sweet Bread								
Pudding								
Fruit Juice								
Cocido with milk								
Water								
Tereré o Mate								
Fruit								
Coca-cola, Pulp, or other soda								
Beer								
Wine								
Aloja								

For each type of food, include how many times you have eaten them or used them as a part of a dish.

	Once a month or less	2-3 times a month	1-2 times a week	3-4 times a week	5-6 times a week	Every day	No answer	I don't know
Green or Red Pepper								
Tomato Sauce for pasta								
White Sauce								
Tomatoes								
Onions								
Greens: spinich, lettuce								
Rice								
Squash								
Beans								
Potatoes, Black Potatoes								
Other vegetables, for example peas, carrots, cucumber								
Corn Vori with vegetable or meat								
Honey								
How often have you used butter or oil to heat, cook, or add flavor to the meal?								
How often have you used mayonnaise?								
How often have you use salt to cook or add flavor to the meal?								
How often have you used sugar to cook or add flavor to the meal?								
How often have you used garlic to cook or add flavor to the meal?								
How often have you use a sugar substitute to cook or add flavor to the meal?								
How often have you used ketchup?								

HOGAR ID

ENCUESTA: FFQ – COMIDA PARAGUAYA

LÍNEA ID: **HG0**

INVESTIGADORA INCIALES

OTRA INVESTIGADORA

FECHA DE ENTREVISTA / / 2010

Día Mes

Piense sobre sus (los de este/a niño/a) hábitos de alimentación durante más o menos el pasado mes. ¿Qué tan seguido usted (este/a niño/a) comen las siguientes comidas ya sea en casa o en los restaurantes?

	1 vez al mes o menos	2-3 veces al mes	1-2 veces a la semana	3-4 veces a la semana	5-6 veces a la semana	todos los días	no contest a	no se
Huevos								
Leche								
Yogur								
Carne								
Pollo o pechuga								
Chorizo								
Pescado								
Chancho								
Conejo								
Carpincho								
Asado								
Menudencias o Mondongo								
Mbeju								
Pajagua Maskada								
Hamburguesas								
Croquetes o Empanadas de pollo/carne/chileno								
Milanesa								
Lomito								
Pastel Mandi'o								
Tortillas								
Panchos								
Sopa Paraguaya								
Chipa								
Sándwich, pollo o carne								
Sándwich, verduras (con huevos)								
Sándwich, jamón y queso								
Pizza								
Arroz o Fideo (con carne o pollo)								
Sopa de verduras o/con carne/pollo								
Papas fritas								
Pan								
Mandioca								
Ensalada de lechuga con tomates y cebolla								
Ensalada de arroz o papa								
Ensalada de fruta								
Maní, Pororó o Galletita								
Chipitas o Galletas								
Caña de azúcar								

HOGAR ID ☐☐☐☐☐

ENCUESTA: FFQ – COMIDA PARAGUAYA

LÍNEA ID: **HG0**☐☐

	1 vez al mes o menos	2-3 veces al mes	1-2 veces a la semana	3-4 veces a la semana	5-6 veces a la semana	todos los días	no contest a	no se
Tortas o pan dulce								
Budín, torta de crema								
Jugo de fruta								
Cocido con leche								
Agua								
Tereré o Mate								
Fruta								
Coca-cola, Pulp, o otra gaseosas								
Cerveza								
Vino								
Aloja								

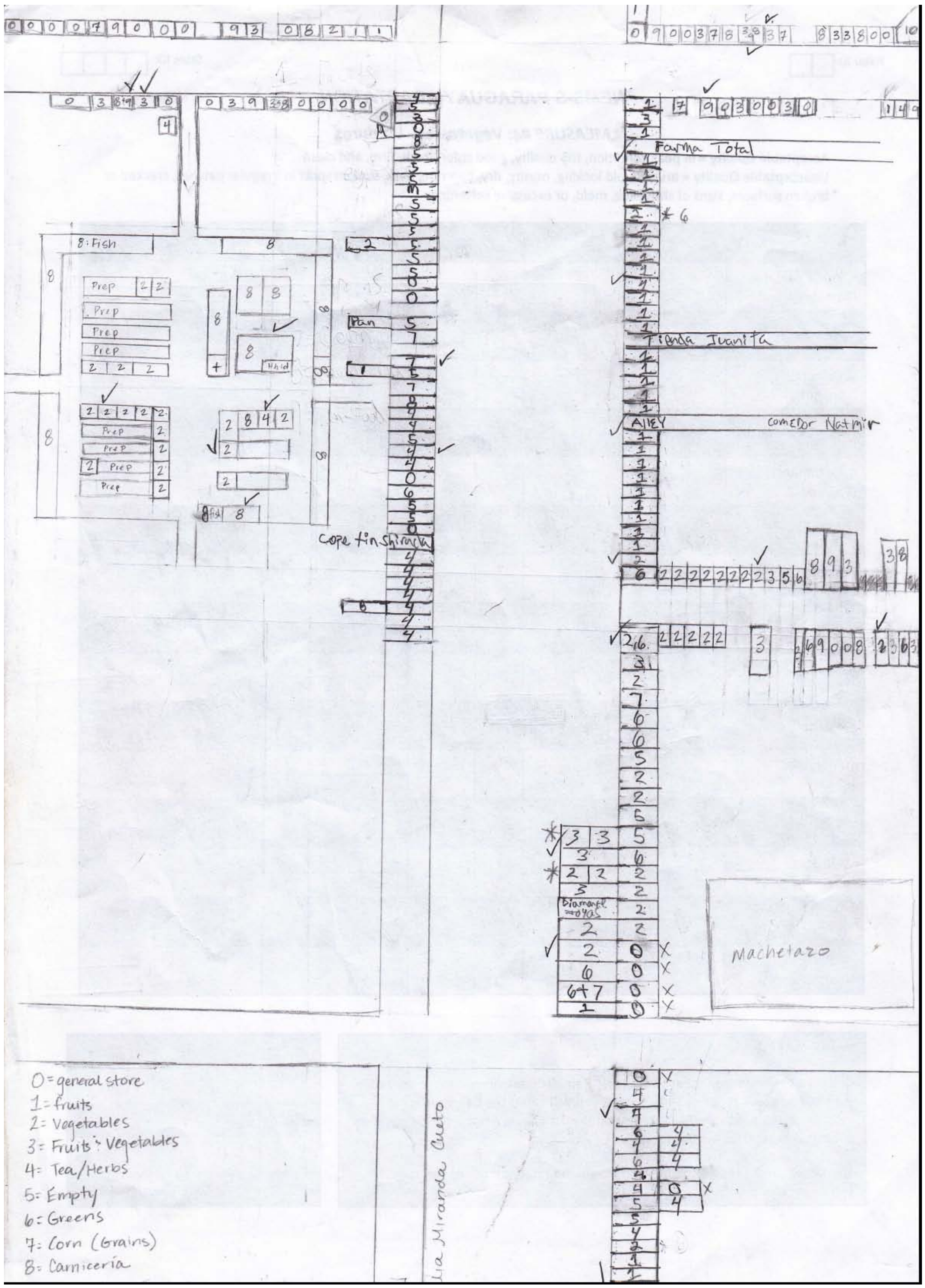
Para este clase de alimentos, incluya las veces que se los comen solos o como parte de otro platillo

	1 vez al mes o menos	2-3 veces al mes	1-2 veces a la semana	3-4 veces a la semana	5-6 veces a la semana	todos los días	no contest a	no se
Pimienta roja o verdura								
Salsas de tomates por fideo								
Salsas blanca								
Tomates								
Cebollas								
Verduras, por ejemplo espinaca, lechuga – berro								
Arroz								
Zapallo, Calabacitas								
Poroto, Legumbres								
Papas, Papas negras								
Otro vegetales, por ejemplo arbejas, zanahoria, pepino								
Vori de maíz, con verdura o carne								
Miel de abeja								
¿Qué tan seguido usa manteca o aceite para freír, cocinar o darle sabor a la comida?								
¿Qué tan seguido usa mayonesa?								
¿Qué tan seguido usa sal para cocinar o darle sabor a la comida?								
¿Qué tan seguido usa azúcar para cocinar o darle sabor a la comida?								
¿Qué tan seguido usa ajo para cocinar o darle sabor a la comida?								
¿Qué tan seguido usa edulcorante para cocinar o darle sabor a la comida?								
¿Qué tan seguido usa kétchup?								

APPENDIX C

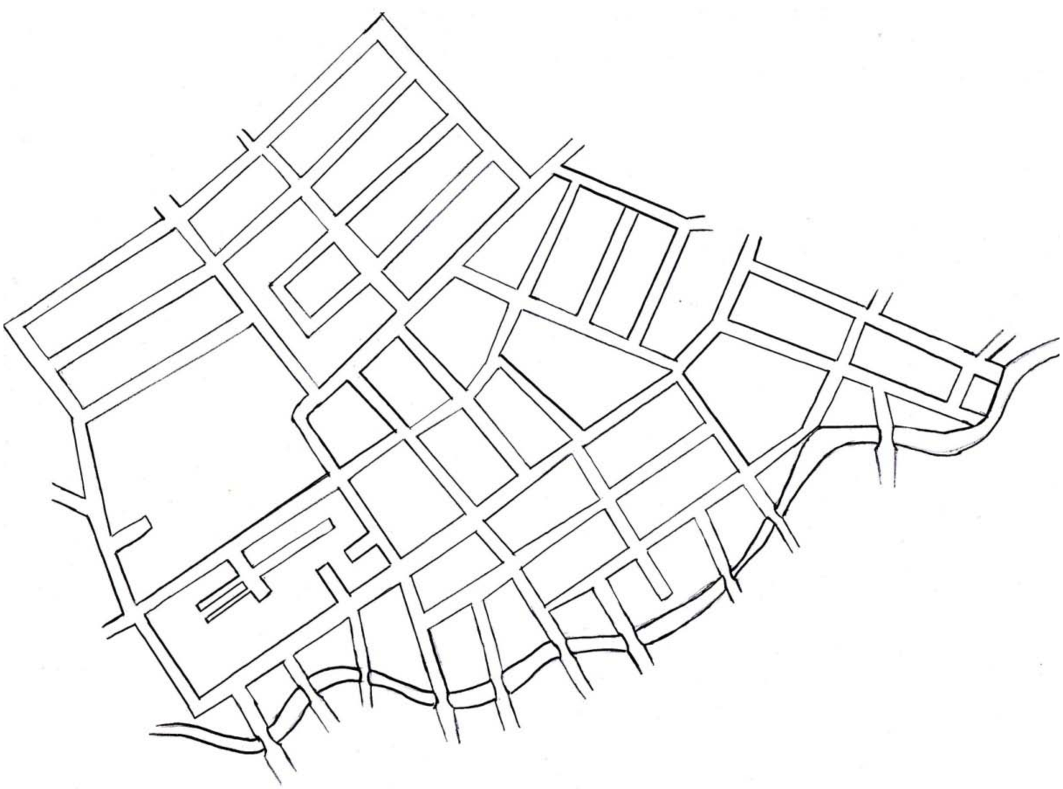
FIELD SITE MAPS

City Neighborhood Map; the black box represents the downtown district



Hand-drawn Map of the Open Air Market

Enlarged Map Photo (above); Traced Map Photo (below)



Final Neighborhood (*Rio Barrio*) Map; "P" indicates a park or plaza; "A" indicates abandoned houses in the block; "F" indicates a factory. Despensas are not shown to protect the identity of local families.

APPENDIX D

FOOD STORE COMPARISONS

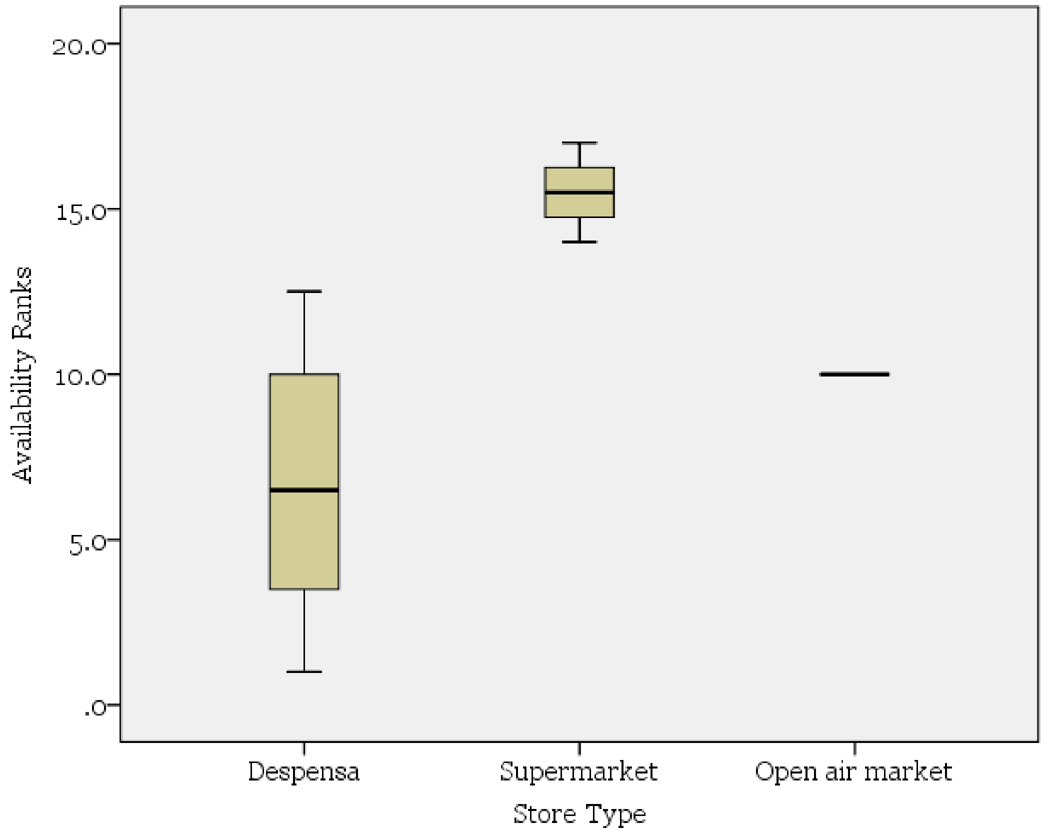


Figure D.1. Box-plot of Availability Ranks by Store Type

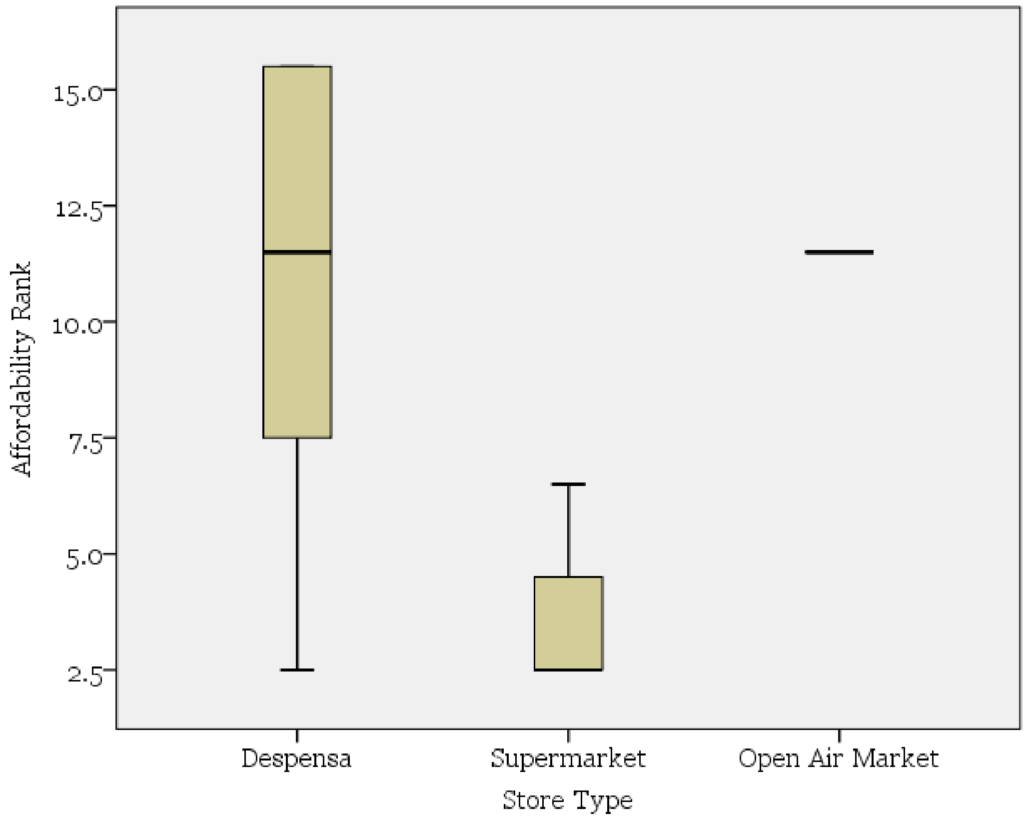


Figure D.2. Box-plot of Affordability Ranks by Store Type

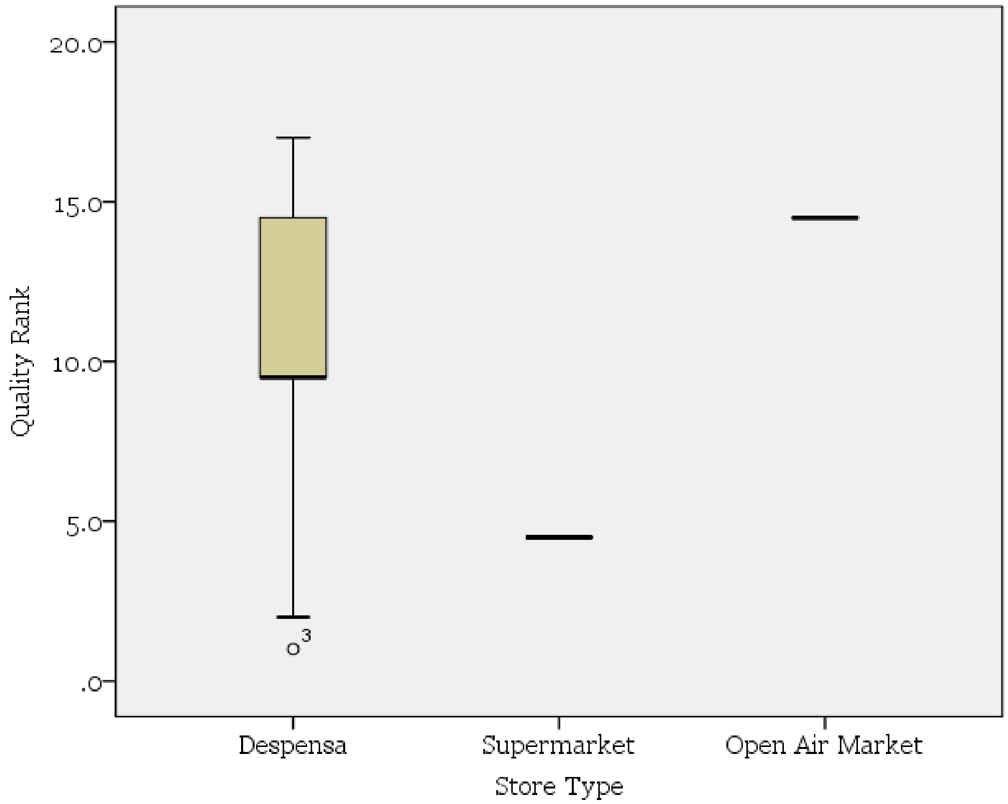


Figure D.3. Box-pot of Quality Rank by Store Type

Table D.1

Group Statistics of Store Ranks between the Downtown District and the Neighborhood District

Rank Category	Downtown Market (N=5)			Rio Barrio Market (N=12)		
	μ	σ	SEM	μ	σ	SEM
Availability	14.4	2.679	1.198	6.75	3.923	1.132
Affordability	5.1	3.975	1.778	10.63	4.483	1.294
Quality	6.5	4.472	2.000	10.04	4.826	1.393

Table D.2

Independent T-tests of Store Ranks by Store Types; First Group=Supermarkets and Open Air Market; Second Group=Despensas.

Type of Store Rank		Levene's Test		t-test for Equality of Means						
									95% CI	
		F	Sig.	t	df	Sig.	µd	SEM	Lower	Upper
Availability	Equal σ^2	1.775	.203	3.956	15	.001	7.650	1.934	3.529	11.772
	Not equal σ^2			**4.641**	**11.1**	**.001**	7.650	1.648	4.027	11.274
Affordability	Equal σ^2	0.235	.635	-2.384	15	.031	-5.525	2.317	-10.464	-0.586
	Not equal σ^2			**-2.513**	**8.5**	**.035**	-5.525	2.199	-10.544	-0.506
Quality	Equal σ^2	0.013	.911	-1.405	15	.180	-3.542	2.520	-8.913	1.830
	Not equal σ^2			-1.453	8.1	.184	-3.542	2.437	-9.147	2.064

Table D.3

Group Statistics of Store Ranks between Supermarkets and Despensas

Rank Category	Supermarkets (N=4)			Despensas (N=12)		
	μ	σ	SEM	μ	σ	SEM
Availability	15.5	1.225	0.612	6.75	3.923	1.132
Affordability	3.5	2	1	10.63	4.483	1.294
Quality	4.5	0	0	10.04	4.826	1.393

Table D.4

Independent T-tests of Store Ranks by Store Types; First Group=Supermarkets; Second Group=Despensas.

Type of Store Rank		Levene's Test		t-test for Equality of Means						
									95% CI	
		F	Sig.	t	df	Sig.	μd	SEM	Lower	Upper
Availability	Equal σ^2	5.866	.030	4.302	14	.001	8.750	2.034	4.388	13.112
	Not equal σ^2			**6.797**	**13.9**	**.000**	8.750	1.287	5.989	11.511
Affordability	Equal σ^2	3.301	.091	-3.025	14	.009	-7.125	2.356	-12.177	-2.073
	Not equal σ^2			**-4.357**	**12.2**	**.001**	-7.125	1.636	-10.683	-3.567
Quality	Equal σ^2	4.073	.063	-2.244	14	.042	-5.542	2.470	-10.839	-.244
	Not equal σ^2			**-3.978**	**11.0**	**.002**	-5.542	1.393	-8.608	-2.475

APPENDIX E

DIETARY AND NUTRITIONAL OUTCOMES

Complete Listing of the food frequency variables, their description, and corresponding food groups used in dietary variety analysis.

Variable Name	Variable Description	Food Group
FFQ_AceiteManteca	Oil or Butter	Condiments
FFQ_Arroz	Rice	Sweets, Snacks, and Carbohydrates
FFQ_ArrozFideo	Rice or Pasta Dish with Tomato Sauce	Lunch and Dinner Entrees
FFQ_Asado	Barbeque Beef Ribs	Lunch and Dinner Entrees
FFQ_Azucar	Sugar	Condiments
FFQ_Budin	Pudding	Sweets, Snacks, and Carbohydrates
FFQ_Carne	Red Meat	Lunch and Dinner Entrees
FFQ_Cebollas	Onions	Fruits and Vegetables
FFQ_ChipitaGalletas	Chipitas (Small Cheese Crackers with Licorace) and Cookies	Sweets, Snacks, and Carbohydrates
FFQ_Chorizo	Sausage	Lunch and Dinner Entrees
FFQ_Cocido	Hot Tea with Sugar and Milk	Energy-containing Beverages
FFQ_CroqEmpanada	Croquettes and Empanadas	Lunch and Dinner Entrees
FFQ_Edulcorante	Sugar Substitute	Condiments
FFQ_EnsaladaArrozPapa	Rice or Potato Salad	Sweets, Snacks, and Carbohydrates
FFQ_EnsaladaFruta	Fruit Salad	Fruits and Vegetables
FFQ_EnsaladaLechuga	Lettuce Salad	Fruits and Vegetables
FFQ_Fruta	Fruit (various)	Fruits and Vegetables
FFQ_Gaseosas	Soda	Energy-containing Beverages
FFQ_Hamburg	Hamburger	Lunch and Dinner Entrees
FFQ_huevos	Eggs	Lunch and Dinner Entrees
FFQ_Jugo	Juice	Energy-containing Beverages

FFQ_Ketchup	Ketchup	Condiments
FFQ_Leche	Milk	Energy-containing Beverages
FFQ_Mandioca	Manioc	Sweets, Snacks, and Carbohydrates
FFQ_ManiPororoGalletita	Peanuts, Popcorn, Crackers	Sweets, Snacks, and Carbohydrates
FFQ_Mayonesa	Mayonnaise	Condiments
FFQ_Miel	Honey	Condiments
FFQ_Milanesa	Fried Chicken or Beef Steak	Lunch and Dinner Entrees
FFQ_Pan	White Bread	Sweets, Snacks, and Carbohydrates
FFQ_Panchos	Hot Dogs	Lunch and Dinner Entrees
FFQ_PapaFrita	French Fries	Sweets, Snacks, and Carbohydrates
FFQ_Papas	Potatoes	Sweets, Snacks, and Carbohydrates
FFQ_Pimienta	Green Pepper	Fruits and Vegetables
FFQ_Pizza	Pizza	Lunch and Dinner Entrees
FFQ_Pollo	Chicken	Lunch and Dinner Entrees
FFQ_Poroto	Bean Soup	Lunch and Dinner Entrees
FFQ_Sal	Salt	Condiments
FFQ_SopaPgya	Sopa Paraguaya: Cornbread	Sweets, Snacks, and Carbohydrates
FFQ_TerereMate	Terere or Mate: Infused Caffinated Tea	Energy-containing Beverages
FFQ_Tomates	Tomatoes	Fruits and Vegetables
FFQ_Tortas	Cake	Sweets, Snacks, and Carbohydrates
FFQ_Tortillas	Tortillas: Egg Battered Dough in Oil	Sweets, Snacks, and Carbohydrates
FFQ_Vegetales	Vegetables (various)	Fruits and Vegetables
FFQ_Vori	Chicken Soup with Corn Balls	Lunch and Dinner Entrees
FFQ_Yogur	Yogurt	Dairy
FFQ_Zapallo	Squash	Fruits and Vegetables

Syntax to develop the food group categories and the Dietary Variety variables.

```
If (FFQ_AceiteManteca =0) CondimentVAR1=0.
IF (FFQ_AceiteManteca =1) CondimentVAR1=1.
If (FFQ_AceiteManteca >1) CondimentVAR1=1.

If (FFQ_Azucar =0) CondimentVAR2=0.
IF (FFQ_Azucar =1) CondimentVAR2=1.
If (FFQ_Azucar >1) CondimentVAR2=1.

If (FFQ_Edulcorante =0) CondimentVAR3=0.
IF (FFQ_Edulcorante =1) CondimentVAR3=1.
If (FFQ_Edulcorante >1) CondimentVAR3=1.

If (FFQ_Ketchup =0) CondimentVAR4=0.
IF (FFQ_Ketchup =1) CondimentVAR4=1.
If (FFQ_Ketchup >1) CondimentVAR4=1.

If (FFQ_Mayonesa =0) CondimentVAR5=0.
IF (FFQ_Mayonesa =1) CondimentVAR5=1.
If (FFQ_Mayonesa >1) CondimentVAR5=1.
```

```
If (FFQ_Miel =0) CondimentVAR6=0.

IF (FFQ_Miel =1) CondimentVAR6=1.

If (FFQ_Miel >1) CondimentVAR6=1.


If (FFQ_Sal =0) CondimentVAR7=0.

IF (FFQ_Sal =1) CondimentVAR7=1.

If (FFQ_Sal >1) CondimentVAR7=1.


Compute Condiment = (CondimentVAR1 + CondimentVAR2 +
CondimentVAR3 + CondimentVAR4 + CondimentVAR5 +
CondimentVAR6 + CondimentVAR7)/7.  Execute.


If (FFQ_Yogur =0) DairyVAR1=0.

If (FFQ_Yogur =1) DairyVAR1=1.

If (FFQ_Yogur >1) DairyVAR1=1.


Compute Dairy = DairyVAR1/1.  Execute.


If (FFQ_Cocido =0) EnergyBeveragesVAR1=0.

If (FFQ_Cocido =1) EnergyBeveragesVAR1=1.

If (FFQ_Cocido >1) EnergyBeveragesVAR1=1.
```

If (FFQ_Gaseosas =0) EnergyBeveragesVAR2=0.

If (FFQ_Gaseosas =1) EnergyBeveragesVAR2=1.

If (FFQ_Gaseosas >1) EnergyBeveragesVAR2=1.

If (FFQ_Jugo =0) EnergyBeveragesVAR3=0.

If (FFQ_Jugo =1) EnergyBeveragesVAR3=1.

If (FFQ_Jugo >1) EnergyBeveragesVAR3=1.

If (FFQ_Leche =0) EnergyBeveragesVAR4=0.

If (FFQ_Leche =1) EnergyBeveragesVAR4=1.

If (FFQ_Leche >1) EnergyBeveragesVAR4=1.

If (FFQ_TerereMate =0) EnergyBeveragesVAR5=0.

If (FFQ_TerereMate =1) EnergyBeveragesVAR5=1.

If (FFQ_TerereMate >1) EnergyBeveragesVAR5=1.

Compute EnergyBeverages = (EnergyBeveragesVAR1 + EnergyBeveragesVAR2 + EnergyBeveragesVAR3 +EnergyBeveragesVAR4 + EnergyBeveragesVAR5) / 5. Execute.

If (FFQ_ArrozFideo =0) EntreesVAR1=0.

If (FFQ_ArrozFideo =1) EntreesVAR1=1.

If (FFQ_ArrozFideo >1) EntreesVAR1=1.

```
If (FFQ_Asado =0) EntreesVAR2=0.
If (FFQ_Asado =1) EntreesVAR2=1.
If (FFQ_Asado >1) EntreesVAR2=1.

If (FFQ_Carne =0) EntreesVAR3=0.
If (FFQ_Carne =1) EntreesVAR3=1.
If (FFQ_Carne >1) EntreesVAR3=1.

If (FFQ_Chorizo =0) EntreesVAR4=0.
If (FFQ_Chorizo =1) EntreesVAR4=1.
If (FFQ_Chorizo >1) EntreesVAR4=1.

If (FFQ_CroqEmpanada =0) EntreesVAR5=0.
If (FFQ_CroqEmpanada =1) EntreesVAR5=1.
If (FFQ_CroqEmpanada >1) EntreesVAR5=1.

If (FFQ_Hamburg =0) EntreesVAR6=0.
If (FFQ_Hamburg =1) EntreesVAR6=1.
If (FFQ_Hamburg >1) EntreesVAR6=1.

If (FFQ_huevos =0) EntreesVAR7=0.
If (FFQ_huevos =1) EntreesVAR7=1.
```

If (FFQ_huevos >1) EntreesVAR7=1.

If (FFQ_Milanesa =0) EntreesVAR8=0.

If (FFQ_Milanesa =1) EntreesVAR8=1.

If (FFQ_Milanesa >1) EntreesVAR8=1.

If (FFQ_Panchos =0) EntreesVAR9=0.

If (FFQ_Panchos =1) EntreesVAR9=1.

If (FFQ_Panchos >1) EntreesVAR9=1.

If (FFQ_Pizza =0) EntreesVAR10=0.

If (FFQ_Pizza =1) EntreesVAR10=1.

If (FFQ_Pizza >1) EntreesVAR10=1.

If (FFQ_Pollo =0) EntreesVAR11=0.

If (FFQ_Pollo =1) EntreesVAR11=1.

If (FFQ_Pollo >1) EntreesVAR11=1.

If (FFQ_Poroto =0) EntreesVAR12=0.

If (FFQ_Poroto =1) EntreesVAR12=1.

If (FFQ_Poroto >1) EntreesVAR12=1.

If (FFQ_Vori =0) EntreesVAR13=0.

If (FFQ_Vori =1) EntreesVAR13=1.

If (FFQ_Vori >1) EntreesVAR13=1.

Compute Entrees = (EntreesVAR1 + EntreesVAR2 + EntreesVAR3 + EntreesVAR4 + EntreesVAR5 + EntreesVAR6 + EntreesVAR7 + EntreesVAR8 + EntreesVAR9 + EntreesVAR10 + EntreesVAR11 + EntreesVAR12 + EntreesVAR13)/13. Execute.

If (FFQ_Arroz =0) CarbohydratesVAR1=0.

If (FFQ_Arroz =1) CarbohydratesVAR1=1.

If (FFQ_Arroz >1) CarbohydratesVAR1=1.

If (FFQ_Budin =0) CarbohydratesVAR2=0.

If (FFQ_Budin =1) CarbohydratesVAR2=1.

If (FFQ_Budin >1) CarbohydratesVAR2=1.

If (FFQ_ChipitaGalletas =0) CarbohydratesVAR3=0.

If (FFQ_ChipitaGalletas =1) CarbohydratesVAR3=1.

If (FFQ_ChipitaGalletas >1) CarbohydratesVAR3=1.

If (FFQ_EnsaladaArrozPapa =0) CarbohydratesVAR4=0.

If (FFQ_EnsaladaArrozPapa =1) CarbohydratesVAR4=1.

If (FFQ_EnsaladaArrozPapa >1) CarbohydratesVAR4=1.

If (FFQ_Mandioca =0) CarbohydratesVAR5=0.

If (FFQ_Mandioca =1) CarbohydratesVAR5=1.

If (FFQ_Mandioca >1) CarbohydratesVAR5=1.

If (FFQ_ManiPororoGalletita =0) CarbohydratesVAR6=0.

If (FFQ_ManiPororoGalletita =1) CarbohydratesVAR6=1.

If (FFQ_ManiPororoGalletita >1) CarbohydratesVAR6=1.

If (FFQ_Pan =0) CarbohydratesVAR7=0.

If (FFQ_Pan =1) CarbohydratesVAR7=1.

If (FFQ_Pan >1) CarbohydratesVAR7=1.

If (FFQ_PapaFrita =0) CarbohydratesVAR8=0.

If (FFQ_PapaFrita =1) CarbohydratesVAR8=1.

If (FFQ_PapaFrita >1) CarbohydratesVAR8=1.

If (FFQ_Papas =0) CarbohydratesVAR9=0.

If (FFQ_Papas =1) CarbohydratesVAR9=1.

If (FFQ_Papas >1) CarbohydratesVAR9=1.

If (FFQ_SopaPgya =0) CarbohydratesVAR10=0.

If (FFQ_SopaPgya =1) CarbohydratesVAR10=1.

If (FFQ_SopaPgya >1) CarbohydratesVAR10=1.

If (FFQ_Tortillas =0) CarbohydratesVAR11=0.

If (FFQ_Tortillas =1) CarbohydratesVAR11=1.

If (FFQ_Tortillas >1) CarbohydratesVAR11=1.

If (FFQ_Tortas =0) CarbohydratesVAR12=0.

If (FFQ_Tortas =1) CarbohydratesVAR12=1.

If (FFQ_Tortas >1) CarbohydratesVAR12=1.

Compute Carbohydrates = (CarbohydratesVAR1 + CarbohydratesVAR2 + CarbohydratesVAR3 + CarbohydratesVAR4 + CarbohydratesVAR5 + CarbohydratesVAR6 + CarbohydratesVAR7 + CarbohydratesVAR8 + CarbohydratesVAR9 + CarbohydratesVAR10 + CarbohydratesVAR11 + CarbohydratesVAR12)/12. Execute.

If (FFQ_Cebollas =0) VegetableVAR1=0.

If (FFQ_Cebollas =1) VegetableVAR1=1.

If (FFQ_Cebollas >1) VegetableVAR1=1.

If (FFQ_EnsaladaLechuga =0) VegetableVAR2=0.

If (FFQ_EnsaladaLechuga =1) VegetableVAR2=1.

If (FFQ_EnsaladaLechuga >1) VegetableVAR2=1.

If (FFQ_Pimienta =0) VegetableVAR3=0.

If (FFQ_Pimienta =1) VegetableVAR3=1.

If (FFQ_Pimienta >1) VegetableVAR3=1.

If (FFQ_Tomates =0) VegetableVAR4=0.

If (FFQ_Tomates =1) VegetableVAR4=1.

If (FFQ_Tomates >1) VegetableVAR4=1.

If (FFQ_Vegetales =0) VegetableVAR5=0.

If (FFQ_Vegetales =1) VegetableVAR5=1.

If (FFQ_Vegetales >1) VegetableVAR5=1.

If (FFQ_Zapallo =0) VegetableVAR6=0.

If (FFQ_Zapallo =1) VegetableVAR6=1.

If (FFQ_Zapallo >1) VegetableVAR6=1.

If (FFQ_EnsaladaFruta =0) FruitVAR1=0.

If (FFQ_EnsaladaFruta =1) FruitVAR1=1.

If (FFQ_EnsaladaFruta >1) FruitVAR1=1.

If (FFQ_Fruta =0) FruitVAR2=0.

If (FFQ_Fruta =1) FruitVAR2=1.

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If (FFQ_Fruta >1) FruitVAR2=1.

Compute FruitVegetable = (VegetableVAR1 + VegetableVAR2 +
VegetableVAR3 + VegetableVAR4 + VegetableVAR5 + VegetableVAR6 +
FruitVAR1 + FruitVAR2) / 8.  Execute.

Compute DietaryDiversity = (VegetableVAR1 + VegetableVAR2 +
VegetableVAR3 + VegetableVAR4 + VegetableVAR5 + VegetableVAR6 +
FruitVAR1 + FruitVAR2 + CarbohydratesVAR1 + CarbohydratesVAR2 +
CarbohydratesVAR3 + CarbohydratesVAR4 + CarbohydratesVAR5 +
CarbohydratesVAR6 + CarbohydratesVAR7 + CarbohydratesVAR8 +
CarbohydratesVAR9 + CarbohydratesVAR10 + CarbohydratesVAR11 +
CarbohydratesVAR12 + EntreesVAR1 + EntreesVAR2 + EntreesVAR3 +
EntreesVAR4 + EntreesVAR5 + EntreesVAR6 + EntreesVAR7 +
EntreesVAR8 + EntreesVAR9 + EntreesVAR10 + EntreesVAR11 +
EntreesVAR12 + EntreesVAR13 + EnergyBeveragesVAR1 +
EnergyBeveragesVAR2 + EnergyBeveragesVAR3 + EnergyBeveragesVAR4
+ EnergyBeveragesVAR5 + DairyVAR1 + CondimentVAR1 +
CondimentVAR2 + CondimentVAR3 + CondimentVAR4 +
CondimentVAR5 + CondimentVAR6 + CondimentVAR7) / 46.  Execute.
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Table E.1a

Group Statistics of Independent Variables between Consented and Not Consented Individuals, Ages 7 and older; Gender is coded: 0=Male; 1=Female; Education Level is coded: 0=No Education; 1=Primary School; 2=Secondary School; 3=Technical or University Education.

Independent Variable	Consented (N=126)			Not Consented (N=172)		
	μ	σ	SEM	μ	σ	SEM
Gender	.75	.432	.039	.35	.478	.036
Age in Years	34.3	19.9	1.8	29.5	17.2	1.3
Education Level	1.73	.784	.070	1.72	.881	.067

Table E.1b

Independent Samples of the Independent Variables: Not Consented (First Group) versus Consented Participants (Second Group); Ages 7 and older.

Independent Variable		Levene's Test		t-test for Equality of Means						
									95% CI	
		F	Sig.	t	df	Sig.	µd	SEM	Lower	Upper
Gender	Equal σ^2	15.557	0.000	-7.522	296	0.00	-0.41	0.054	-0.511	-0.299
	Not equal σ^2			**-7.639**	**283**	**0.00**	-0.41	0.053	-0.510	-0.301
Age	Equal σ^2	7.055	0.008	-2.239	296	0.03	-4.82	2.152	-9.053	-0.584
	Not equal σ^2			**-2.190**	**245**	**0.03**	-4.82	2.201	-9.153	-0.484
Education Level	Equal σ^2	1.059	0.304	-0.094	296	0.93	-0.01	0.099	-0.203	0.185
	Not equal σ^2			-0.095	285	0.92	-0.01	0.097	-0.200	0.181

Table E.2

Food Consumption Frequency by Food Group

Food Group	Food Variety	Never	Monthly	Weekly	Daily
Condiments	Butter or Oil	4 (3%)	0 (0%)	6 (5%)	111 (92%)
	Honey	85 (70%)	11 (9%)	15 (13%)	10 (8%)
	Ketchup	73 (60%)	9 (8%)	33 (27%)	6 (5%)
	Mayonnaise	46 (38%)	8 (7%)	51 (42%)	16 (13%)
	Salt	5 (4%)	0 (0%)	0 (0%)	116 (96%)
	Sugar	20 (16%)	0 (0%)	0 (0%)	101 (84%)
	Sugar-free Sweetener	95 (78%)	1 (1%)	2 (2%)	23 (19%)
Dairy	Yogurt	52 (43%)	9 (7%)	29 (24%)	31 (26%)
Energy-Containing Beverages	Cocido	19 (16%)	3 (2%)	20 (17%)	79 (65%)
	Juice	14 (12%)	3 (3%)	39 (32%)	65 (54%)
	Milk	6 (5%)	0 (0%)	6 (5%)	109 (90%)
	Soda	32 (27%)	9 (7%)	41 (34%)	39 (32%)
	Terere or Mate	16 (13%)	1 (1%)	8 (7%)	96 (79%)

Fruits and Vegetables	Fruit	25 (21%)	4 (3%)	34 (28%)	58 (48%)
	Fruit Salad	70 (58%)	12 (10%)	31 (25%)	8 (7%)
	Green Pepper	20 (17%)	4 (3%)	8 (7%)	89 (74%)
	Lettuce Salad	20 (16%)	8 (7%)	51 (42%)	42 (35%)
	Onions	9 (7%)	1 (1%)	3 (3%)	108 (89%)
	Squash	32 (26%)	8 (7%)	53 (44%)	28 (23%)
	Tomatoes	3 (3%)	0 (0%)	4 (3%)	114 (94%)
	Vegetables (Other)	32 (26%)	7 (6%)	58 (48%)	24 (20%)
Lunch and Dinner Entrees	Arroz or Fideo	6 (5%)	1 (1%)	55 (45%)	59 (49%)
	Asado	10 (8%)	69 (57%)	41 (34%)	1 (1%)
	Beef	1 (1%)	2 (2%)	39 (32%)	79 (65%)
	Chicken	10 (8%)	16 (13%)	84 (70%)	11 (9%)
	Croquettes or Empanadas	38 (31%)	22 (18%)	48 (40%)	13 (11%)
	Eggs	22 (18%)	22 (18%)	62 (52%)	14 (12%)
	Hamburgers	52 (43%)	28 (23%)	37 (31%)	4 (3%)
	Hot Dogs	62 (51%)	22 (18%)	31 (26%)	6 (5%)
	Milanesa	34 (28%)	28 (23%)	55 (46%)	4 (3%)
	Pizza	39 (32%)	35 (29%)	45 (37%)	2 (2%)
	Poroto	16 (13%)	15 (12%)	87 (72%)	3 (3%)
	Sausage	42 (35%)	37 (31%)	39 (32%)	3 (2%)
	Vori Vori	23 (19%)	17 (14%)	80 (66%)	1(1%)

	Cake	46 (38%)	28 (22%)	33 (27%)	14 (12%)
	Chipitas or Crackers	76 (63%)	7 (6%)	21 (17%)	17 (14%)
	French Fries	98 (81%)	12 (10%)	10 (8%)	1 (1%)
	Manioc	24 (20%)	5 (4%)	42 (35%)	50 (41%)
	Paraguayan Tortillas	19 (16%)	19 (16%)	68 (56%)	15 (12%)
Sweets, Snacks, and Carbohydrates	Peanuts, Popcorn, Cookies	50 (41%)	11 (9%)	41 (34%)	19 (16%)
	Potatoes	30 (25%)	2 (2%)	38 (31%)	51 (42%)
	Pudding	78 (65%)	22 (18%)	17 (14%)	4 (3%)
	Rice	4 (4%)	1 (1%)	68 (56%)	47 (39%)
	Rice or Potato Salad	34 (28%)	16 (13%)	59 (49%)	12 (10%)
	Sopa Paraguaya	36 (29%)	49 (41%)	35 (29%)	1 (1%)
	White Bread	3 (3%)	1 (1%)	7 (6%)	109 (90%)

Table E.3

Independent Samples Age Test: Children (First Group) versus Adult (Second Group); significant values shown in ***bold.***

Food Item		Levene's Test		t-test for Equality of Means						
									95% CI	
		F	Sig.	t	df	Sig.	µd	SEM	Lower	Upper
Eggs	Equal σ^2	.582	.447	-.441	119	.660	-.860	1.951	-4.723	3.003
	Not equal σ^2			-.815	97.6	.417	-.860	1.055	-2.953	1.233
Milk	Equal σ^2	2.398	.124	-.850	119	.397	-.126	.148	-.420	.168
	Not equal σ^2			-.736	35.3	.467	-.126	.171	-.474	.222
Yogurt	Equal σ^2	.462	.498	1.087	119	.279	.300	.276	-.247	.847
	Not equal σ^2			1.096	42.6	.279	.300	.274	-.252	.853
Beef	Equal σ^2	**35.569**	**.000**	**2.884**	**119**	**.005**	.346	.120	.109	.584
	Not equal σ^2			**3.970**	**81.5**	**.000**	.346	.087	.173	.520
Chicken	Equal σ^2	2.560	.112	-.735	119	.464	-.115	.157	-.426	.196
	Not equal σ^2			-.665	37.0	.510	-.115	.174	-.467	.236
Sausage	Equal σ^2	.027	.869	-.165	119	.869	-.032	.193	-.414	.350
	Not equal σ^2			-.166	42.4	.869	-.032	.192	-.419	.355

Fruit	Equal σ^2	.175	.677	-1.685	119	.095	-.424	.252	-.922	.074
	Not equal σ^2			-1.666	41.5	.103	-.424	.254	-.938	.090
Green Pepper	Equal σ^2	3.511	.063	-1.352	119	.179	-.336	.248	-.827	.156
	Not equal σ^2			-1.238	37.6	.223	-.336	.271	-.885	.213
Tomatoes	Equal σ^2	2.878	.092	-.922	119	.358	-.100	.109	-.315	.115
	Not equal σ^2			-.778	34.4	.442	-.100	.129	-.361	.161
Onions	Equal σ^2	**17.179**	**.000**	-2.424	119	.017	-.422	.174	-.767	-.077
	Not equal σ^2			-1.865	31.8	.071	-.422	.226	-.884	.039
Other Kinds of Vegetables	Equal σ^2	1.630	.204	-1.940	119	.055	-.454	.234	-.916	.009
	Not equal σ^2			-1.909	41.2	.063	-.454	.238	-.933	.026
Squash	Equal σ^2	1.096	.297	**-2.444**	**119**	**.016**	-.581	.238	-1.051	-.110
	Not equal σ^2			**-2.409**	**41.3**	**.021**	-.581	.241	-1.068	-.094
Manioc	Equal σ^2	.122	.728	-.452	119	.652	-.111	.246	-.598	.375
	Not equal σ^2			-.444	41.0	.659	-.111	.250	-.617	.394
Potatoes	Equal σ^2	1.598	.209	-1.568	119	.120	-.407	.260	-.922	.107
	Not equal σ^2			-1.515	40.1	.138	-.407	.269	-.951	.136
Rice	Equal σ^2	.648	.422	-.325	119	.746	-.049	.151	-.349	.251
	Not equal σ^2			-.289	36.3	.774	-.049	.170	-.395	.296
White Bread	Equal σ^2	**13.551**	**.000**	1.874	119	.063	2.445	1.305	-.138	5.029
	Not equal σ^2			.997	26.0	.328	2.445	2.452	-2.595	7.486
Sopa Paraguaya	Equal σ^2	**11.388**	**.001**	-1.168	119	.245	-.201	.172	-.543	.140
	Not equal σ^2			-.985	34.4	.331	-.201	.204	-.616	.214

Mayonnaise	Equal σ^2	**6.656**	**.011**	1.124	119	.263	.274	.244	-.209	.756
	Not equal σ^2			1.233	48.8	.224	.274	.222	-.173	.720
Asado	Equal σ^2	.560	.456	**2.767**	**119**	**.007**	.364	.132	.104	.625
	Not equal σ^2			**2.852**	**44.1**	**.007**	.364	.128	.107	.621
Arroz or Fideo	Equal σ^2	.461	.498	**2.000**	**119**	**.048**	.321	.161	.003	.639
	Not equal σ^2			**2.096**	**45.2**	**.042**	.321	.153	.013	.630
Milanesa	Equal σ^2	**6.380**	**.013**	1.095	119	.276	.216	.197	-.175	.606
	Not equal σ^2			.955	35.6	.346	.216	.226	-.243	.674
Tortillas	Equal σ^2	.719	.398	1.071	119	.286	.208	.195	-.177	.594
	Not equal σ^2			1.082	42.7	.285	.208	.193	-.180	.597
Vori Vori	Equal σ^2	3.282	.073	-1.128	119	.262	-.199	.176	-.547	.150
	Not equal σ^2			-1.023	37.2	.313	-.199	.194	-.592	.195
Poroto	Equal σ^2	1.401	.239	.829	119	.409	.134	.162	-.187	.455
	Not equal σ^2			.854	44.0	.398	.134	.157	-.183	.452
Hamburger	Equal σ^2	3.309	.071	**3.843**	**119**	**.000**	.742	.193	.360	1.124
	Not equal σ^2			**3.376**	**35.9**	**.002**	.742	.220	.296	1.188
Pizza	Equal σ^2	**4.662**	**.033**	.442	119	.660	.084	.191	-.294	.462
	Not equal σ^2			.392	36.2	.698	.084	.215	-.352	.521

Croquettes Empanada	Equal σ^2	1.789	.184	1.268	119	.207	.284	.224	-.160	.729
	Not equal σ^2			1.163	37.6	.252	.284	.245	-.211	.780
Peanuts, Popcorn, Cookies	Equal σ^2	.034	.854	.855	119	.394	.216	.252	-.284	.716
	Not equal σ^2			.840	41.1	.406	.216	.257	-.303	.735
Cake	Equal σ^2	2.409	.123	**2.690**	**119**	**.008**	.603	.224	.159	1.047
	Not equal σ^2			**2.471**	**37.7**	**.018**	.603	.244	.109	1.097
Lettuce Salad	Equal σ^2	1.871	.174	**-3.195**	**119**	**.002**	-.699	.219	-1.132	-.266
	Not equal σ^2			**-3.094**	**40.3**	**.004**	-.699	.226	-1.155	-.243
Rice or Potato Salad	Equal σ^2	.045	.833	.014	119	.989	.003	.220	-.433	.439
	Not equal σ^2			.014	42.1	.989	.003	.220	-.442	.448
Terere or Mate	Equal σ^2	**25.229**	**.000**	**-4.576**	**119**	**.000**	-.956	.209	-1.370	-.542
	Not equal σ^2			**-3.525**	**31.8**	**.001**	-.956	.271	-1.509	-.403
Cocido	Equal σ^2	**6.859**	**.010**	1.496	119	.137	.359	.240	-.116	.833
	Not equal σ^2			1.778	57.1	.081	.359	.202	-.045	.762
Soda	Equal σ^2	**10.111**	**.002**	**4.281**	**119**	**.000**	1.029	.240	.553	1.505
	Not equal σ^2			**4.925**	**53.4**	**.000**	1.029	.209	.610	1.448
Juice	Equal σ^2	1.255	.265	-.131	119	.896	-.028	.214	-.452	.396
	Not equal σ^2			-.143	48.7	.887	-.028	.196	-.421	.365

Sugar	Equal σ^2	3.341	.070	.855	119	.394	.209	.245	-.275	.694
	Not equal σ^2			.950	49.9	.347	.209	.220	-.233	.652
Sugar Substitute	Equal σ^2	**28.736**	**.000**	**-2.138**	**119**	**.035**	-.549	.257	-1.057	-.041
	Not equal σ^2			**-2.950**	**81.8**	**.004**	-.549	.186	-.919	-.179
French Fries	Equal σ^2	**16.821**	**.000**	2.461	119	.015	.343	.139	.067	.619
	Not equal σ^2			1.898	31.8	.067	.343	.181	-.025	.711
Hot Dogs	Equal σ^2	**12.275**	**.001**	2.099	119	.038	.441	.210	.025	.856
	Not equal σ^2			1.763	34.3	.087	.441	.250	-.067	.948
Fruit Salad	Equal σ^2	.640	.425	-.393	119	.695	-.089	.227	-.538	.360
	Not equal σ^2			-.408	44.6	.685	-.089	.218	-.529	.351
Honey	Equal σ^2	.130	.719	.034	119	.973	.007	.219	-.425	.440
	Not equal σ^2			.036	45.5	.971	.007	.208	-.411	.426
Oil or Butter	Equal σ^2	**22.684**	**.000**	-2.324	119	.022	-.285	.123	-.528	-.042
	Not equal σ^2			-1.501	28.3	.145	-.285	.190	-.674	.104
Salt	Equal σ^2	.064	.801	.126	119	.900	.017	.131	-.244	.277
	Not equal σ^2			.130	44.0	.897	.017	.128	-.241	.274
Ketchup	Equal σ^2	.844	.360	**2.242**	**119**	**.027**	.489	.218	.057	.920
	Not equal σ^2			**2.197**	**40.9**	**.034**	.489	.222	.039	.938
Pudding	Equal σ^2	.755	.387	-.044	119	.965	-.008	.188	-.380	.363
	Not equal σ^2			-.046	45.4	.963	-.008	.179	-.368	.351
Chipitas or Crackers	Equal σ^2	.844	.360	.882	119	.380	.223	.253	-.278	.725
	Not equal σ^2			.856	40.4	.397	.223	.261	-.304	.751

Table E.4

Independent Samples Gender Test: Male (First Group) versus Female (Second Group); significant values shown in ***bold****.*

Food Item		Levene's Test		t-test for Equality of Means						
									95% CI	
		F	Sig.	t	df	Sig.	µd	SEM	Lower	Upper
Eggs	Equal σ^2	.418	.519	-.589	119	.557	-1.13	1.94	-4.95	2.68
	Not equal σ^2			-1.060	98.5	.292	-1.13	1.07	-3.26	.990
Milk	Equal σ^2	.877	.351	-.458	119	.648	-.067	.147	-.358	.223
	Not equal σ^2			-.407	38.1	.686	-.067	.165	-.401	.267
Yogurt	Equal σ^2	1.939	.166	-.854	119	.395	-.233	.273	-.775	.308
	Not equal σ^2			-.899	48.3	.373	-.233	.260	-.756	.289
Beef	Equal σ^2	.038	.845	-.135	119	.893	-.017	.123	-.259	.226
	Not equal σ^2			-.135	44.7	.893	-.017	.122	-.263	.230
Chicken	Equal σ^2	**7.560**	**.007**	-1.269	119	.207	-.196	.154	-.501	.110
	Not equal σ^2			-1.059	35.6	.297	-.196	.185	-.571	.179
Sausage	Equal σ^2	.857	.356	.319	119	.751	.061	.190	-.316	.438
	Not equal σ^2			.305	41.8	.762	.061	.199	-.341	.462

Fruit	Equal σ²	3.898	.051	-1.669	119	.098	-.415	.249	-.907	.077
	Not equal σ²			-1.529	39.5	.134	-.415	.271	-.963	.134
Green Pepper	Equal σ²	**5.113**	**.026**	1.056	119	.293	.260	.246	-.227	.746
	Not equal σ²			1.215	57.2	.229	.260	.214	-.168	.687
Tomatoes	Equal σ²	2.533	.114	-.864	119	.390	-.093	.107	-.305	.120
	Not equal σ²			-.740	36.6	.464	-.093	.125	-.346	.161
Onions	Equal σ²	1.692	.196	-.686	119	.494	-.121	.176	-.469	.228
	Not equal σ²			-.613	38.3	.544	-.121	.197	-.519	.278
Other Kinds of Vegetables	Equal σ²	1.094	.298	-1.020	119	.310	-.238	.233	-.700	.224
	Not equal σ²			-.986	42.6	.330	-.238	.242	-.725	.249
Squash	Equal σ²	.922	.339	-.740	119	.461	-.177	.240	-.652	.298
	Not equal σ²			-.713	42.2	.479	-.177	.249	-.679	.324
Manioc	Equal σ²	.011	.918	.516	119	.607	.125	.242	-.355	.605
	Not equal σ²			.529	46.2	.599	.125	.237	-.351	.602
Potatoes	Equal σ²	2.691	.104	-.982	119	.328	-.253	.258	-.765	.258
	Not equal σ²			-.925	40.9	.360	-.253	.274	-.807	.300
Rice	Equal σ²	1.931	.167	-.414	119	.680	-.062	.149	-.358	.234
	Not equal σ²			-.358	36.9	.723	-.062	.173	-.412	.289
White Bread	Equal σ²	1.214	.273	-.395	119	.693	-.516	1.306	-3.102	2.070
	Not equal σ²			-.722	92.0	.472	-.516	.715	-1.935	.903
Sopa Paraguaya	Equal σ²	.367	.546	-1.155	119	.250	-.197	.170	-.534	.140
	Not equal σ²			-1.141	43.7	.260	-.197	.172	-.544	.151

Mayonnaise	Equal σ^2	.046	.830	-.300	119	.764	-.073	.242	-.551	.406
	Not equal σ^2			-.302	45.0	.764	-.073	.240	-.556	.411
Asado	Equal σ^2	.041	.840	.126	119	.900	.017	.134	-.248	.282
	Not equal σ^2			.129	46.3	.898	.017	.131	-.246	.280
Arroz or Fideo	Equal σ^2	.016	.899	.391	119	.696	.063	.161	-.256	.382
	Not equal σ^2			.393	44.9	.696	.063	.160	-.260	.386
Milanesa	Equal σ^2	.175	.677	1.264	119	.209	.246	.194	-.139	.631
	Not equal σ^2			1.287	45.8	.205	.246	.191	-.139	.630
Tortillas	Equal σ^2	1.708	.194	.898	119	.371	.173	.192	-.208	.554
	Not equal σ^2			.942	48.1	.351	.173	.183	-.196	.542
Vori Vori	Equal σ^2	**4.157**	**.044**	.893	119	.374	.156	.174	-.189	.500
	Not equal σ^2			.996	53.8	.324	.156	.156	-.157	.469
Poroto	Equal σ^2	.343	.559	-.818	119	.415	-.131	.160	-.448	.186
	Not equal σ^2			-.817	44.4	.419	-.131	.160	-.454	.192
Hamburger	Equal σ^2	.089	.766	.373	119	.710	.075	.202	-.325	.475
	Not equal σ^2			.371	44.2	.712	.075	.203	-.334	.484
Pizza	Equal σ^2	1.237	.268	-.818	119	.415	-.154	.188	-.527	.219
	Not equal σ^2			-.742	38.9	.463	-.154	.208	-.574	.266

Croquettes Empanada	Equal σ^2	2.726	.101	1.189	119	.237	.263	.222	-.175	.702
	Not equal σ^2			1.082	39.1	.286	.263	.244	-.229	.756
Peanuts, Popcorn, Cookies	Equal σ^2	.206	.651	.426	119	.671	.106	.250	-.388	.601
	Not equal σ^2			.426	44.6	.672	.106	.249	-.396	.609
Cake	Equal σ^2	.019	.892	-.096	119	.924	-.022	.228	-.473	.430
	Not equal σ^2			-.093	42.7	.926	-.022	.234	-.495	.451
Lettuce Salad	Equal σ^2	2.306	.132	-1.376	119	.171	-.307	.223	-.749	.135
	Not equal σ^2			-1.303	41.2	.200	-.307	.236	-.783	.169
Rice or Potato Salad	Equal σ^2	1.187	.278	.784	119	.434	.170	.217	-.259	.600
	Not equal σ^2			.809	46.8	.422	.170	.210	-.253	.593
Terere or Mate	Equal σ^2	1.780	.185	-.745	119	.458	-.166	.223	-.608	.276
	Not equal σ^2			-.684	39.6	.498	-.166	.243	-.658	.325
Cocido	Equal σ^2	.046	.830	-.154	119	.878	-.037	.239	-.510	.436
	Not equal σ^2			-.150	42.8	.881	-.037	.245	-.531	.458
Soda	Equal σ^2	3.112	.080	1.634	119	.105	.412	.252	-.087	.911
	Not equal σ^2			1.700	47.4	.096	.412	.242	-.076	.900
Juice	Equal σ^2	.935	.336	.249	119	.804	.053	.211	-.366	.471
	Not equal σ^2			.271	51.4	.787	.053	.194	-.337	.442

Sugar	Equal σ^2	2.285	.133	-.792	119	.430	-.191	.242	-.670	.287
	Not equal σ^2			-.730	39.8	.470	-.191	.262	-.721	.338
Sugar Substitute	Equal σ^2	.003	.958	-.022	119	.982	-.006	.258	-.517	.506
	Not equal σ^2			-.022	44.6	.982	-.006	.258	-.526	.514
French Fries	Equal σ^2	**6.062**	**.015**	1.295	119	.198	.181	.140	-.096	.458
	Not equal σ^2			1.072	35.3	.291	.181	.169	-.162	.525
Hot Dogs	Equal σ^2	.059	.809	1.421	119	.158	.297	.209	-.117	.712
	Not equal σ^2			1.375	42.5	.176	.297	.216	-.139	.733
Fruit Salad	Equal σ^2	.819	.367	.690	119	.491	.154	.224	-.289	.597
	Not equal σ^2			.701	45.6	.487	.154	.220	-.289	.598
Honey	Equal σ^2	.283	.596	-.093	119	.926	-.020	.216	-.447	.407
	Not equal σ^2			-.098	48.9	.922	-.020	.204	-.429	.389
Oil or Butter	Equal σ^2	**7.576**	**.007**	-1.451	119	.150	-.178	.123	-.421	.065
	Not equal σ^2			-1.108	32.8	.276	-.178	.161	-.506	.149
Salt	Equal σ^2	.115	.735	.169	119	.866	.022	.130	-.235	.279
	Not equal σ^2			.176	47.6	.861	.022	.125	-.229	.272
Ketchup	Equal σ^2	**4.090**	**.045**	**3.680**	**119**	**.000**	.766	.208	.354	1.178
	Not equal σ^2			**3.356**	**39.3**	**.002**	.766	.228	.304	1.227
Pudding	Equal σ^2	2.041	.156	-.941	119	.349	-.174	.184	-.539	.192
	Not equal σ^2			-.994	48.6	.325	-.174	.175	-.525	.178
Chipitas or Crackers	Equal σ^2	2.025	.157	-.582	119	.562	-.146	.251	-.642	.350
	Not equal σ^2			-.611	48.1	.544	-.146	.239	-.626	.334

Table E.5

*Independent Samples Children and Gender Test: Child Only Population, Men (First Group) versus Women (Second Group); significant values shown in **bold**.*

Food Item		Levene's Test		t-test for Equality of Means						
									95% CI	
		F	Sig.	t	df	Sig.	µd	SEM	Lower	Upper
Eggs	Equal σ^2	.870	.360	.115	25	.910	.040	0.347	-.676	0.754
	Not equal σ^2			0.119	23.9	.906	.040	0.335	-.652	0.731
Milk	Equal σ^2	.002	.963	.121	25	.905	.040	.329	-.637	.717
	Not equal σ^2			.118	19.7	.907	.040	.337	-.664	.744
Yogurt	Equal σ^2	0.770	.389	0.273	25	.787	.136	.499	-.891	1.164
	Not equal σ^2			0.278	22.9	.783	.136	.490	-.879	1.151
Beef	Equal σ^2	3.839	.061	-.949	25	.351	-.119	.126	-.378	.140
	Not equal σ^2			-.871	15.2	.397	-.119	.137	-.411	.172
Chicken	Equal σ^2	1.087	.307	0.121	25	.905	.040	.329	-.637	.717
	Not equal σ^2			0.113	16.6	.911	.040	.351	-.703	.783
Sausage	Equal σ^2	.560	.461	.440	25	.664	.153	.349	-.565	.872
	Not equal σ^2			.431	20.2	.671	.153	.356	-.588	.895

Fruit	Equal σ^2	**7.456**	**.011**	0.415	25	.682	.193	.466	-.767	1.153
	Not equal σ^2			0.383	15.8	.707	.193	.504	-.876	1.263
Green Pepper	Equal σ^2	0.839	.368	-0.067	25	.947	-.034	.512	-1.088	1.020
	Not equal σ^2			-0.068	23.1	.946	-.034	.501	-1.071	1.002
Tomatoes	Equal σ^2	0.067	.798	.023	25	.982	.006	.249	-.506	.518
	Not equal σ^2			.025	23.9	.980	.006	.224	-.456	.467
Onions	Equal σ^2	.094	.762	-.165	25	.870	-.074	.446	-.993	.846
	Not equal σ^2			-.162	20.2	.873	-.074	.455	-1.022	.875
Other Kinds of Vegetables	Equal σ^2	.119	.733	-1.403	25	.173	-.591	.421	-1.458	.277
	Not equal σ^2			-1.416	22.3	.171	-.591	.417	-1.456	.274
Squash	Equal σ^2	.456	.506	-.013	25	.990	-.006	.444	-.919	.908
	Not equal σ^2			-.013	20.9	.990	-.006	.448	-.938	.926
Manioc	Equal σ^2	1.373	.252	-0.595	25	.557	-.273	.458	-1.216	.671
	Not equal σ^2			-0.579	19.4	.569	-.273	.471	-1.258	.712
Potatoes	Equal σ^2	0.026	.873	-.784	25	.440	-.386	.493	-1.401	.628
	Not equal σ^2			-.795	22.6	.435	-.386	.486	-1.393	.620
Rice	Equal σ^2	0.217	.645	.070	25	.945	.023	.325	-.646	.691
	Not equal σ^2			.068	19.3	.947	.023	.334	-.677	.722
White Bread	Equal σ^2	3.113	.090	-0.771	25	.448	-3.87	5.029	-14.23	6.483
	Not equal σ^2			-0.935	15.0	.365	-3.87	4.144	-12.71	4.958
Sopa Paraguaya	Equal σ^2	.011	.915	-0.144	25	.887	-.057	.395	-.870	.756
	Not equal σ^2			-0.145	22.3	.886	-.057	.391	-.868	.754

Mayonnaise	Equal σ^2	.955	.338	.513	25	.612	.199	.388	-.599	.997
	Not equal σ^2			.524	23.1	.605	.199	.380	-.586	.984
Asado	Equal σ^2	.361	.553	-.074	25	.942	-.017	.231	-.492	.458
	Not equal σ^2			-.077	23.9	.940	-.017	.223	-.476	.442
Arroz or Fideo	Equal σ^2	1.487	.234	.604	25	.551	.165	.273	-.397	.726
	Not equal σ^2			.666	24.4	.512	.165	.247	-.346	.675
Milanesa	Equal σ^2	4.946	.035	1.288	25	.210	.540	.419	-.323	1.403
	Not equal σ^2			1.351	24.6	.189	.540	.399	-.284	1.363
Tortillas	Equal σ^2	1.512	.230	.016	25	.987	.006	.351	-.717	.729
	Not equal σ^2			.017	24.6	.987	.006	.334	-.682	.694
Vori Vori	Equal σ^2	2.040	.166	1.941	25	.064	.665	.343	-.041	1.370
	Not equal σ^2			2.003	23.8	.057	.665	.332	-.020	1.350
Poroto	Equal σ^2	.141	.710	-.624	25	.538	-.176	.282	-.757	.405
	Not equal σ^2			-.637	23.1	.530	-.176	.277	-.748	.396
Hamburger	Equal σ^2	.612	.441	-1.405	25	.172	-.568	.404	-1.401	.264
	Not equal σ^2			-1.385	20.5	.181	-.568	.410	-1.422	.286
Pizza	Equal σ^2	2.950	.098	0.901	25	.376	.364	.404	-.468	1.195
	Not equal σ^2			0.852	17.3	.406	.364	.427	-.536	1.263

Croquettes Empanada	Equal σ^2	0.000	.998	.432	25	.669	.199	.460	-.749	1.146
	Not equal σ^2			.429	20.9	.673	.199	.464	-.766	1.164
Peanuts, Popcorn, Cookies	Equal σ^2	0.347	.561	1.171	25	.253	.540	.461	-.409	1.489
	Not equal σ^2			1.167	21.4	.256	.540	.463	-.421	1.501
Cake	Equal σ^2	0.868	.360	0.161	25	.874	.074	.460	-.874	1.021
	Not equal σ^2			0.156	19.2	.878	.074	.475	-.918	1.066
Lettuce Salad	Equal σ^2	.086	.772	0.190	25	.851	.080	.418	-.781	.940
	Not equal σ^2			.187	20.2	.854	.080	.426	-.808	.967
Rice or Potato Salad	Equal σ^2	4.137	.053	.976	25	.338	.386	.396	-.429	1.202
	Not equal σ^2			1.038	24.9	.309	.386	.372	-.381	1.153
Terere or Mate	Equal σ^2	1.783	.194	-1.041	25	.308	-.545	.524	-1.624	.534
	Not equal σ^2			-1.016	19.7	.322	-.545	.537	-1.667	.576
Cocido	Equal σ^2	**5.251**	**.031**	1.159	25	.257	.381	.328	-.296	1.057
	Not equal σ^2			1.335	20.9	.196	.381	.285	-.212	.974
Soda	Equal σ^2	**5.464**	**.028**	1.007	25	.323	.352	.350	-.368	1.073
	Not equal σ^2			1.150	21.8	.263	.352	.306	-.283	.988
Juice	Equal σ^2	.993	.329	1.467	25	.155	.483	.329	-.195	1.161
	Not equal σ^2			1.637	23.7	.115	.483	.295	-.126	1.092

Sugar	Equal σ^2	0.292	.593	0.267	25	.792	.102	.383	-.687	.892
	Not equal σ^2			0.273	23.3	.787	.102	.374	-.671	.876
Sugar Substitute	Equal σ^2	0.008	.929	-.021	25	.984	-.006	.272	-.566	.555
	Not equal σ^2			-.022	24.3	.983	-.006	.261	-.544	.533
French Fries	Equal σ^2	3.489	.074	.825	25	.417	.290	.351	-.434	1.013
	Not equal σ^2			.764	15.9	.456	.290	.379	-.514	1.094
Hot Dogs	Equal σ^2	2.854	.104	**2.464**	**25**	**.021**	1.068	.434	.175	1.961
	Not equal σ^2			**2.628**	**24.9**	**.014**	1.068	.407	.231	1.905
Fruit Salad	Equal σ^2	0.040	.843	.333	25	.742	.131	.392	-.677	.939
	Not equal σ^2			.335	22.1	.741	.131	.390	-.677	.939
Honey	Equal σ^2	.049	.827	.616	25	.543	.227	.369	-.533	.987
	Not equal σ^2			.624	22.6	.539	.227	.364	-.527	.982
Oil or Butter	Equal σ^2	4.637	.041	-1.195	25	.243	-.449	.376	-1.222	.325
	Not equal σ^2			-1.097	15.3	.290	-.449	.409	-1.319	.422
Salt	Equal σ^2	3.118	.090	.824	25	.418	.188	.228	-.281	.656
	Not equal σ^2			1.000	15.0	.333	.188	.188	-.212	.587
Ketchup	Equal σ^2	0.038	.847	1.730	25	.096	.670	.388	-.128	1.469
	Not equal σ^2			1.704	20.5	.104	.670	.393	-.149	1.490
Pudding	Equal σ^2	2.338	.139	0.428	25	.672	.136	.319	-.520	.793
	Not equal σ^2			0.392	15.2	.700	.136	.348	-.604	.877
Chipitas or Crackers	Equal σ^2	0.006	.937	0.641	25	.528	.307	.479	-.680	1.293
	Not equal σ^2			0.636	21.1	.532	.307	.482	-.696	1.310

Table E.6

Independent Samples Adult and Gender Test: Adult Only Population, Men (First Group) versus Women (Second Group); significant values shown in ***bold.***

Food Item		Levene's Test		t-test for Equality of Means						
									95% CI	
		F	Sig.	t	df	Sig.	µd	SEM	Lower	Upper
Eggs	Equal σ^2	.299	.586	-.544	92	.588	-1.48	2.716	-6.87	3.916
	Not equal σ^2			-1.134	83.4	.260	-1.48	1.303	-4.07	1.114
Milk	Equal σ^2	.750	.389	-.466	92	.642	-.079	.170	-.418	.259
	Not equal σ^2			-.407	20.9	.688	-.079	.195	-.486	.327
Yogurt	Equal σ^2	**4.502**	**.037**	-1.561	92	.122	-.527	.338	-1.198	.143
	Not equal σ^2			-1.760	27.3	.090	-.527	.299	-1.141	.087
Beef	Equal σ^2	.216	.643	-.546	92	.587	-.088	.161	-.408	.232
	Not equal σ^2			-.529	22.9	.602	-.088	.166	-.431	.256
Chicken	Equal σ^2	**5.206**	**.025**	-1.542	92	.127	-.282	.183	-.645	.081
	Not equal σ^2			-1.263	19.9	.221	-.282	.223	-.747	.184
Sausage	Equal σ^2	.282	.596	.138	92	.891	.033	.239	-.441	.507
	Not equal σ^2			.129	22.1	.899	.033	.255	-.495	.561

Fruit	Equal σ²	.765	.384	-1.936	92	.056	-.587	.303	-1.189	.015
	Not equal σ²			-1.821	22.2	.082	-.587	.322	-1.255	.081
Green Pepper	Equal σ²	**17.733**	**.000**	**1.837**	**92**	**.069**	.532	.289	-.043	1.106
	Not equal σ²			**2.994**	**61.78**	**.004**	.532	.178	.177	.887
Tomatoes	Equal σ²	3.428	.067	-.912	92	.364	-.112	.122	-.354	.131
	Not equal σ²			-.614	17.9	.547	-.112	.182	-.493	.270
Onions	Equal σ²	.010	.919	-.042	92	.967	-.008	.184	-.373	.357
	Not equal σ²			-.040	22.5	.969	-.008	.193	-.407	.391
Other Kinds of Vegetables	Equal σ²	.023	.880	.221	92	.825	.063	.287	-.506	.632
	Not equal σ²			.218	23.2	.830	.063	.291	-.539	.665
Squash	Equal σ²	.511	.477	-.252	92	.802	-.073	.291	-.652	.505
	Not equal σ²			-.239	22.4	.813	-.073	.307	-.709	.562
Manioc	Equal σ²	.740	.392	1.203	92	.232	.359	.299	-.234	.952
	Not equal σ²			1.388	28.3	.176	.359	.259	-.171	.889
Potatoes	Equal σ²	1.979	.163	-.227	92	.821	-.072	.316	-.699	.556
	Not equal σ²			-.204	21.4	.840	-.072	.351	-.801	.658
Rice	Equal σ²	1.415	.237	-.506	92	.614	-.089	.177	-.440	.261
	Not equal σ²			-.419	20.1	.680	-.089	.214	-.535	.356
White Bread	Equal σ²	**6.393**	**.013**	**1.199**	**92**	**.234**	.182	.152	-.119	.483
	Not equal σ²			**2.563**	**76.0**	**.012**	.182	.071	.041	.323
Sopa Paraguaya	Equal σ²	.155	.695	-1.076	92	.285	-.209	.194	-.594	.176
	Not equal σ²			-1.108	24.4	.279	-.209	.188	-.597	.180

Mayonnaise	Equal σ^2	.000	.998	-.967	92	.336	-.299	.309	-.912	.315
	Not equal σ^2			-.954	23.3	.350	-.299	.313	-.946	.348
Asado	Equal σ^2	.372	.544	-.550	92	.584	-.090	.164	-.416	.235
	Not equal σ^2			-.558	23.9	.582	-.090	.162	-.424	.243
Arroz or Fideo	Equal σ^2	.171	.680	-.444	92	.658	-.089	.201	-.489	.311
	Not equal σ^2			-.409	21.8	.686	-.089	.218	-.542	.363
Milanesa	Equal σ^2	.073	.788	.235	92	.815	.053	.228	-.399	.506
	Not equal σ^2			.239	24.1	.813	.053	.224	-.409	.516
Tortillas	Equal σ^2	.234	.629	.805	92	.423	.193	.240	-.284	.670
	Not equal σ^2			.800	23.5	.432	.193	.242	-.306	.693
Vori Vori	Equal σ^2	1.404	.239	-.015	92	.988	-.003	.208	-.416	.410
	Not equal σ^2			-.017	29.1	.986	-.003	.177	-.365	.359
Poroto	Equal σ^2	.668	.416	-.822	92	.413	-.166	.202	-.566	.235
	Not equal σ^2			-.783	22.5	.442	-.166	.212	-.604	.273
Hamburger	Equal σ^2	.029	.865	.577	92	.565	.129	.224	-.315	.573
	Not equal σ^2			.565	23.1	.577	.129	.228	-.343	.602
Pizza	Equal σ^2	.206	.651	**-2.00**	**92**	**.048**	-.437	.218	-.870	-.004
	Not equal σ^2			**-2.09**	**24.7**	**.047**	-.437	.209	-.868	-.006

Croquettes Empanada	Equal σ^2	3.141	.080	.818	92	.416	.217	.265	-.310	.744
	Not equal σ^2			.712	20.8	.485	.217	.305	-.417	.851
Peanuts, Popcorn, Cookies	Equal σ^2	2.274	.135	-.524	92	.601	-.162	.309	-.775	.451
	Not equal σ^2			-.548	24.8	.588	-.162	.295	-.771	.447
Cake	Equal σ^2	1.523	.220	-1.035	92	.303	-.274	.265	-.800	.252
	Not equal σ^2			-1.179	27.7	.249	-.274	.233	-.751	.203
Lettuce Salad	Equal σ^2	.770	.383	-1.032	92	.305	-.273	.265	-.800	.253
	Not equal σ^2			-.940	21.6	.358	-.273	.291	-.878	.331
Rice or Potato Salad	Equal σ^2	.044	.834	.298	92	.766	.081	.272	-.459	.621
	Not equal σ^2			.286	22.6	.777	.081	.283	-.505	.667
Terere or Mate	Equal σ^2	**11.267**	**.001**	**1.489**	**92**	**.140**	.325	.218	-.108	.758
	Not equal σ^2			**3.183**	**76.0**	**.002**	.325	.102	.122	.528
Cocido	Equal σ^2	1.847	.177	-1.154	92	.252	-.358	.310	-.973	.258
	Not equal σ^2			-1.022	21.1	.319	-.358	.350	-1.085	.370
Soda	Equal σ^2	.066	.798	.389	92	.698	.121	.310	-.495	.737
	Not equal σ^2			.384	23.3	.704	.121	.314	-.528	.770
Juice	Equal σ^2	.032	.859	-.497	92	.621	-.135	.272	-.676	.406
	Not equal σ^2			-.497	23.6	.624	-.135	.272	-.697	.427

Sugar	Equal σ^2	**5.492**	**.021**	-1.339	92	.184	-.415	.310	-1.03	.200
	Not equal σ^2			-1.140	20.5	.267	-.415	.364	-1.173	.343
Sugar Substitute	Equal σ^2	1.159	.285	.526	92	.600	.181	.344	-.503	.865
	Not equal σ^2			.489	21.9	.630	.181	.371	-.587	.950
French Fries	Equal σ^2	.082	.776	.187	92	.852	.028	.147	-.265	.320
	Not equal σ^2			.183	23.2	.856	.028	.150	-.283	.338
Hot Dogs	Equal σ^2	1.388	.242	-.809	92	.420	-.191	.236	-.660	.278
	Not equal σ^2			-.875	25.8	.390	-.191	.218	-.640	.258
Fruit Salad	Equal σ^2	1.381	.243	.734	92	.465	.208	.283	-.354	.770
	Not equal σ^2			.732	23.5	.472	.208	.284	-.379	.795
Honey	Equal σ^2	.762	.385	-.509	92	.612	-.140	.275	-.685	.405
	Not equal σ^2			-.543	25.4	.592	-.140	.258	-.670	.391
Oil or Butter	Equal σ^2	.414	.521	.315	92	.754	.032	.102	-.170	.234
	Not equal σ^2			.430	38.5	.670	.032	.075	-.119	.183
Salt	Equal σ^2	.517	.474	-.364	92	.717	-.060	.164	-.385	.266
	Not equal σ^2			-.316	20.8	.755	-.060	.189	-.452	.333
Ketchup	Equal σ^2	**4.906**	**.029**	**2.741**	**92**	**.007**	.703	.256	.194	1.212
	Not equal σ^2			**2.366**	**20.7**	**.028**	.703	.297	.085	1.321
Pudding	Equal σ^2	**8.544**	**.004**	-1.413	92	.161	-.329	.233	-.792	.134
	Not equal σ^2			-1.862	35.7	.071	-.329	.177	-.688	.030
Chipitas or Crackers	Equal σ^2	**9.923**	**.002**	-1.458	92	.148	-.445	.305	-1.052	.161
	Not equal σ^2			-1.776	30.8	.086	-.445	.251	-.957	.066

Table E.7

Independent Samples Household Size Test: Smaller Households (First Group) versus Larger Households (Second Group); significant values shown in ***bold****.*

Food Item		Levene's Test		t-test for Equality of Means						
									95% CI	
		F	Sig.	t	df	Sig.	µd	SEM	Lower	Upper
Eggs	Equal σ^2	2.136	.146	-.979	119	.330	-1.59	1.620	-4.79	1.622
	Not equal σ^2			-1.003	61.8	.320	-1.59	1.580	-4.745	1.574
Milk	Equal σ^2	1.072	.303	-.614	119	.540	-.076	.124	-.321	.169
	Not equal σ^2			-.613	117.4	.541	-.076	.124	-.321	.169
Yogurt	Equal σ^2	**0.303**	**.583**	-.863	119	.390	-.199	.231	-.656	.258
	Not equal σ^2			-.864	118.9	.389	-.199	.230	-.655	.257
Beef	Equal σ^2	**9.937**	**.002**	-1.805	119	.074	-.184	.102	-.386	.018
	Not equal σ^2			-1.790	103.4	.076	-.184	.103	-.388	.020
Chicken	Equal σ^2	**5.300**	**.023**	-1.221	119	.224	-.159	.130	-.417	.099
	Not equal σ^2			-1.213	107.9	.228	-.159	.131	-.419	.101
Sausage	Equal σ^2	2.409	.123	-1.764	119	.080	-.280	.159	-.594	.034
	Not equal σ^2			-1.759	115.2	.081	-.280	.159	-.595	.035

Fruit	Equal σ²	.123	.727	.008	119	.994	.002	.212	-.418	.422
	Not equal σ²			.008	118.1	.994	.002	.212	-.419	.422
Green Pepper	Equal σ²	0.089	.766	-.308	119	.758	-.064	.208	-.477	0.348
	Not equal σ²			-.308	118.5	.758	-.064	.208	-.477	.348
Tomatoes	Equal σ²	3.601	.060	-.974	119	.332	-.088	.090	-.267	.091
	Not equal σ²			-.966	102.2	.337	-.088	.091	-.269	.093
Onions	Equal σ²	**4.418**	**.038**	1.029	119	.306	.152	.148	-.141	.445
	Not equal σ²			1.036	112.2	.302	.152	.147	-.139	.443
Other Kinds of Vegetables	Equal σ²	.768	.383	-.181	119	.857	-.036	.198	-.427	.356
	Not equal σ²			-.181	118.8	.856	-.036	.197	-.427	.355
Squash	Equal σ²	.259	.612	-.252	119	.801	-.051	.203	-.453	.350
	Not equal σ²			-.252	118.9	.801	-.051	.202	-.452	.350
Manioc	Equal σ²	.580	.448	.236	119	.814	.048	.205	-.357	.454
	Not equal σ²			.237	118.9	.813	.048	.204	-.356	.453
Potatoes	Equal σ²	0.405	.526	-.248	119	.805	-.054	.219	-.487	.379
	Not equal σ²			-.247	118.3	.805	-.054	.219	-.487	.379
Rice	Equal σ²	0.002	.963	**-3.451**	**119**	**.001**	-.415	.120	-.653	-.177
	Not equal σ²			**-3.415**	**97.4**	**.001**	-.415	.122	-.657	-.174
White Bread	Equal σ²	2.468	.119	-1.158	119	.249	-1.27	1.097	-3.44	.901
	Not equal σ²			-1.187	61.9	.240	-1.27	1.070	-3.41	.868
Sopa Paraguaya	Equal σ²	.408	.524	-.571	119	.569	-.082	.144	-.368	.203
	Not equal σ²			-.572	118.9	.569	-.082	.144	-.367	.203

Mayonnaise	Equal σ^2	.294	.589	1.633	119	.105	.329	.202	-.070	.729
	Not equal σ^2			1.630	117.2	.106	.329	.202	-.071	.730
Asado	Equal σ^2	2.357	.127	.559	119	.577	.063	.113	-.160	.287
	Not equal σ^2			.558	116.6	.578	.063	.113	-.161	.287
Arroz or Fideo	Equal σ^2	.163	.688	**-2.09**	**119**	**.039**	-.279	.134	-.543	-.014
	Not equal σ^2			**-2.079**	**113.6**	**.040**	-.279	.134	-.545	-.013
Milanesa	Equal σ^2	.012	.913	.978	119	.330	.161	.164	-.165	.486
	Not equal σ^2			.978	118.8	.330	.161	.164	-.165	.486
Tortillas	Equal σ^2	1.650	.202	.708	119	.480	.115	.163	-.207	.437
	Not equal σ^2			.710	118.8	.479	.115	.162	-.206	.436
Vori Vori	Equal σ^2	**8.490**	**.004**	**-2.237**	**119**	**.027**	-.323	.144	-.609	-.037
	Not equal σ^2			**-2.227**	**113.7**	**.028**	-.323	.145	-.611	-.036
Poroto	Equal σ^2	**11.728**	**.001**	**-2.126**	**119**	**.036**	-.283	.133	-.546	-.019
	Not equal σ^2			**-2.113**	**109.7**	**.037**	-.283	.134	-.548	-.018
Hamburger	Equal σ^2	1.335	.250	-.502	119	.616	-.086	.170	-.423	.252
	Not equal σ^2			-.504	117.9	.615	-.086	.170	-.422	.251
Pizza	Equal σ^2	1.694	.196	0.860	119	.392	.136	.159	-.178	.451
	Not equal σ^2			0.863	117.9	.390	.136	.158	-.177	.450

Croquettes Empanada	Equal σ^2	1.725	.192	.078	119	.938	.015	.188	-.358	.387
	Not equal σ^2			.078	116.3	.938	.015	.189	-.359	.388
Peanuts, Popcorn, Cookies	Equal σ^2	0.008	.929	-.179	119	.858	-.038	.211	-.455	.380
	Not equal σ^2			-.179	118.7	.858	-.038	.211	-.455	.380
Cake	Equal σ^2	0.548	.461	-1.091	119	.277	-.209	.191	-.588	.170
	Not equal σ^2			-1.092	119.0	.277	-.209	.191	-.587	.170
Lettuce Salad	Equal σ^2	1.838	.178	**2.301**	**119**	**.023**	.428	.186	.060	.795
	Not equal σ^2			**2.309**	**118.2**	**.023**	.428	.185	.061	.794
Rice or Potato Salad	Equal σ^2	2.345	.128	-.522	119	.603	-.096	.183	-.459	.267
	Not equal σ^2			-.521	116.1	.604	-.096	.184	-.460	.268
Terere or Mate	Equal σ^2	**8.252**	**.005**	1.645	119	.103	.307	.187	-.063	.677
	Not equal σ^2			1.655	113.9	.101	.307	.185	-.060	.674
Cocido	Equal σ^2	**10.612**	**.001**	**-2.444**	**119**	**.016**	-.481	.197	-.870	-.091
	Not equal σ^2			**-2.425**	**105**	**.017**	-.481	.198	-.874	-.088
Soda	Equal σ^2	.136	.713	.089	119	.929	.019	.215	-.407	.445
	Not equal σ^2			.089	118.2	.929	.019	.215	-.407	.445
Juice	Equal σ^2	.195	.660	.822	119	.413	.146	.178	-.206	.498
	Not equal σ^2			.824	118.9	.412	.146	.178	-.205	.498

Sugar	Equal σ^2	**10.713**	**.001**	-1.594	119	.114	-.322	.202	-.723	.078
	Not equal σ^2			-1.583	108.4	.116	-.322	.204	-.726	.081
Sugar Substitute	Equal σ^2	**12.318**	**.001**	1.677	119	.096	.361	.215	-.065	.787
	Not equal σ^2			1.667	109.8	.098	.361	.217	-.068	.790
French Fries	Equal σ^2	.777	.380	-.297	119	.767	-.035	.119	-.271	.200
	Not equal σ^2			-.298	116.3	.766	-.035	.118	-.270	.199
Hot Dogs	Equal σ^2	1.000	.319	-.695	119	.488	-.124	.178	-.475	.228
	Not equal σ^2			-.695	118.5	.488	-.124	.178	-.475	.228
Fruit Salad	Equal σ^2	0.158	.691	-.312	119	.755	-.059	.189	-.433	.315
	Not equal σ^2			-.312	117.7	.756	-.059	.189	-.434	.316
Honey	Equal σ^2	1.303	.256	-.842	119	.402	-.153	.182	-.512	.207
	Not equal σ^2			-.843	118.8	.401	-.153	.181	-.512	.206
Oil or Butter	Equal σ^2	3.137	.079	.881	119	.380	.092	.104	-.114	.298
	Not equal σ^2			.890	106.0	.375	.092	.103	-.113	.296
Salt	Equal σ^2	**24.46**	**.000**	**2.256**	**119**	**.026**	.242	.107	.030	.454
	Not equal σ^2			**2.313**	**61.0**	**.024**	.242	.105	.033	.451
Ketchup	Equal σ^2	**13.62**	**.000**	**2.309**	**119**	**.023**	.419	.181	.060	.777
	Not equal σ^2			**2.296**	**110.7**	**.024**	.419	.182	.057	.780
Pudding	Equal σ^2	**4.385**	**.038**	1.030	119	.305	.160	.156	-.148	.468
	Not equal σ^2			1.025	111.6	.308	.160	.156	-.150	.470
Chipitas or Crackers	Equal σ^2	0.005	.945	0.194	119	.847	.041	.212	-.378	.460
	Not equal σ^2			0.194	118.9	.847	.041	.212	-.378	.460

Table E.8a

Analysis of Variance for Educational Attainment: Primary School (First Group), Secondary School (Second Group), and Technical or University Degree (Third Group); significant values in ***bold.***

Food Items		Sum of Squares	df	Mean Square	F (Sig.)
Eggs	Between Groups	110.459	2	55.230	.693
	Within Groups	9405.805	118	79.710	(.052)
	Total	9516.264	120		
Milk	Between Groups	.414	2	.207	.445
	Within Groups	54.826	118	.465	(.642)
	Total	55.240	120		
Yogurt	Between Groups	2.833	2	1.416	.882
	Within Groups	189.597	118	1.607	(.417)
	Total	192.430	120		
Beef	Between Groups	1.128	2	.564	1.780
	Within Groups	37.385	118	.317	(.173)
	Total	38.512	120		
Chicken	Between Groups	.109	2	.055	.105
	Within Groups	61.725	118	.523	(.901)
	Total	61.835	120		
Sausage	Between Groups	2.459	2	1.229	1.604
	Within Groups	90.467	118	.767	(.206)
	Total	92.926	120		
Fruit	Between Groups	.156	2	.078	.057
	Within Groups	161.712	118	1.370	(.945)
	Total	161.868	120		
Green Pepper	Between Groups	2.496	2	1.248	.958
	Within Groups	153.768	118	1.303	(.387)
	Total	156.264	120		
Tomatoes	Between Groups	.292	2	.146	.587
	Within Groups	29.312	118	.248	(.558)
	Total	29.603	120		
Onions	Between Groups	3.076	2	1.538	2.374
	Within Groups	76.461	118	.648	(.098)
	Total	79.537	120		

Other Kinds Vegetables	Between Groups	1.137	2	.568	.480
	Within Groups	139.607	118	1.183	(.620)
	Total	140.744	120		
Squash	Between Groups	.539	2	.269	.216
	Within Groups	147.461	118	1.250	(.806)
	Total	148.000	120		
Manioc	Between Groups	9.333	2	4.666	**3.889**
	Within Groups	141.593	118	1.200	**(.023)**
	Total	150.926	120		
Potatoes	Between Groups	1.310	2	.655	.453
	Within Groups	170.690	118	1.447	(.637)
	Total	172.000	120		
Rice	Between Groups	.043	2	.021	.044
	Within Groups	57.247	118	.485	(.957)
	Total	57.289	120		
White Bread	Between Groups	51.273	2	25.636	.700
	Within Groups	4323.686	118	36.641	(.499)
	Total	4374.959	120		
Sopa Paraguaya	Between Groups	3.437	2	1.719	2.834
	Within Groups	71.554	118	.606	(.063)
	Total	74.992	120		
Mayonnaise	Between Groups	1.950	2	.975	.779
	Within Groups	147.735	118	1.252	(.461)
	Total	149.686	120		
Asado	Between Groups	.078	2	.039	.100
	Within Groups	45.922	118	.389	(.905)
	Total	46.000	120		
Arroz, Fideo	Between Groups	.337	2	.168	.300
	Within Groups	66.176	118	.561	(.741)
	Total	66.512	120		
Milanesa	Between Groups	.268	2	.134	.162
	Within Groups	97.781	118	.829	(.851)
	Total	98.050	120		
Tortillas	Between Groups	1.425	2	.712	.894
	Within Groups	93.997	118	.797	(.412)
	Total	95.421	120		
Vori Vori	Between Groups	.068	2	.034	.051
	Within Groups	78.164	118	.662	(.950)
	Total	78.231	120		

Poroto	Between Groups Within Groups Total	6.263 59.737 66.000	2 118 120	3.132 .506	**6.186 (.003)**
Hamburgers	Between Groups Within Groups Total	.302 104.293 104.595	2 118 120	.151 .884	.171 (.843)
Pizza	Between Groups Within Groups Total	1.901 89.272 91.174	2 118 120	.951 .757	1.256 (.288)
Croquettes Empanadas	Between Groups Within Groups Total	4.525 122.765 127.289	2 118 120	2.262 1.040	2.175 (.118)
Peanuts, Popcorn, Cookies	Between Groups Within Groups Total	.555 159.494 160.050	2 118 120	.278 1.352	.205 (.815)
Cake	Between Groups Within Groups Total	2.793 130.348 133.140	2 118 120	1.396 1.105	1.264 (.286)
Lettuce Salad	Between Groups Within Groups Total	2.171 127.531 129.702	2 118 120	1.086 1.081	1.004 (.369)
Rice, Potato Salad	Between Groups Within Groups Total	2.213 118.944 121.157	2 118 120	1.106 1.008	1.097 (.337)
Tereré, Mate	Between Groups Within Groups Total	1.327 126.871 128.198	2 118 120	.664 1.075	.617 (.541)
Cocido	Between Groups Within Groups Total	1.322 144.744 146.066	2 118 120	.661 1.227	.539 (.585)
Soda	Between Groups Within Groups Total	.457 165.989 166.446	2 118 120	.228 1.407	.162 (.850)
Juice	Between Groups Within Groups Total	.666 113.780 114.446	2 118 120	.333 .964	.345 (.709)
Sugar	Between Groups Within Groups Total	1.193 149.055 150.248	2 118 120	.596 1.263	.472 (.625)

Sugar-free Substitute	Between Groups	6.113	2	3.056	2.191 (.116)
	Within Groups	164.631	118	1.395	
	Total	170.744	120		
French Fries	Between Groups	1.324	2	.662	1.576 (.211)
	Within Groups	49.552	118	.420	
	Total	50.876	120		
Hot Dogs	Between Groups	3.399	2	1.699	1.813 (.168)
	Within Groups	110.618	118	.937	
	Total	114.017	120		
Fruit Salad	Between Groups	4.163	2	2.081	1.973 (.144)
	Within Groups	124.465	118	1.055	
	Total	128.628	120		
Honey	Between Groups	.262	2	.131	.130 (.878)
	Within Groups	119.077	118	1.009	
	Total	119.339	120		
Oil, Butter	Between Groups	.626	2	.313	.954 (.388)
	Within Groups	38.697	118	.328	
	Total	39.322	120		
Salt	Between Groups	.430	2	.215	.595 (.553)
	Within Groups	42.710	118	.362	
	Total	43.140	120		
Ketchup	Between Groups	.535	2	.267	.256 (.774)
	Within Groups	122.986	118	1.042	
	Total	123.521	120		
Pudding	Between Groups	1.448	2	.724	.989 (.375)
	Within Groups	86.337	118	.732	
	Total	87.785	120		
Chipitas, Crackers	Between Groups	2.451	2	1.225	.910 (.405)
	Within Groups	158.904	118	1.347	
	Total	161.355	120		

Table E.8b

Multiple Comparisons for Educational Attainment: Bonferroni Post-Hoc

Dependent Variable	Groups		Mean D (I-J)	SE	Sig.	95% CI	
						Lower	Upper
Eggs	Primary School	Secondary School	2.009	1.743	.754	-2.22	6.24
		Technical/University	1.587	2.552	1.000	-4.61	7.79
	Secondary School	Primary School	-2.009	1.743	.754	-6.24	2.22
		Technical/University	-.422	2.547	1.000	-6.61	5.76
	Technical/ University	Primary School	-1.587	2.552	1.000	-7.79	4.61
		Secondary School	.422	2.547	1.000	-5.76	6.61
Milk	Primary School	Secondary School	.053	.133	1.000	-.27	.38
		Technical/University	-.130	.195	1.000	-.60	.34
	Secondary School	Primary School	-.053	.133	1.000	-.38	.27
		Technical/University	-.183	.194	1.000	-.65	.29
	Technical/ University	Primary School	.130	.195	1.000	-.34	.60
		Secondary School	.183	.194	1.000	-.29	.65

Yogurt	Primary School	Secondary School	.119	.247	1.000	-.48	.72
		Technical/University	-.361	.362	.965	-1.24	.52
	Secondary School	Primary School	-.119	.247	1.000	-.72	.48
		Technical/University	-.480	.362	.561	-1.36	.40
	Technical/ University	Primary School	.361	.362	.965	-.52	1.24
		Secondary School	.480	.362	.561	-.40	1.36
Beef	Primary School	Secondary School	-.140	.110	.615	-.41	.13
		Technical/University	.139	.161	1.000	-.25	.53
	Secondary School	Primary School	.140	.110	.615	-.13	.41
		Technical/University	.279	.161	.253	-.11	.67
	Technical/ University	Primary School	-.139	.161	1.000	-.53	.25
		Secondary School	-.279	.161	.253	-.67	.11
Chicken	Primary School	Secondary School	.053	.141	1.000	-.29	.40
		Technical/University	.077	.207	1.000	-.43	.58
	Secondary School	Primary School	-.053	.141	1.000	-.40	.29
		Technical/University	.024	.206	1.000	-.48	.52
	Technical/ University	Primary School	-.077	.207	1.000	-.58	.43
		Secondary School	-.024	.206	1.000	-.52	.48

Sausage	Primary School	Secondary School	-.304	.171	.232	-.72	.11
		Technical/University	-.197	.250	1.000	-.81	.41
	Secondary School	Primary School	.304	.171	.232	-.11	.72
		Technical/University	.107	.250	1.000	-.50	.71
	Technical/ University	Primary School	.197	.250	1.000	-.41	.81
		Secondary School	-.107	.250	1.000	-.71	.50
Fruit	Primary School	Secondary School	.000	.228	1.000	-.55	.56
		Technical/University	-.106	.335	1.000	-.92	.71
	Secondary School	Primary School	.000	.228	1.000	-.56	.55
		Technical/University	-.106	.334	1.000	-.92	.70
	Technical/ University	Primary School	.106	.335	1.000	-.71	.92
		Secondary School	.106	.334	1.000	-.70	.92
Green Pepper	Primary School	Secondary School	.159	.223	1.000	-.38	.70
		Technical/University	-.284	.326	1.000	-1.08	.51
	Secondary School	Primary School	-.159	.223	1.000	-.70	.38
		Technical/University	-.442	.326	.531	-1.23	.35
	Technical/ University	Primary School	.284	.326	1.000	-.51	1.08
		Secondary School	.442	.326	.531	-.35	1.23

Tomatoes	Primary School	Secondary School	.055	.097	1.000	-.18	.29
		Technical/University	-.096	.142	1.000	-.44	.25
	Secondary School	Primary School	-.055	.097	1.000	-.29	.18
		Technical/University	-.151	.142	.872	-.50	.19
	Technical/ University	Primary School	.096	.142	1.000	-.25	.44
		Secondary School	.151	.142	.872	-.19	.50
Onions	Primary School	Secondary School	.261	.157	.298	-.12	.64
		Technical/University	-.173	.230	1.000	-.73	.39
	Secondary School	Primary School	-.261	.157	.298	-.64	.12
		Technical/University	-.434	.230	.184	-.99	.12
	Technical/ University	Primary School	.173	.230	1.000	-.39	.73
		Secondary School	.434	.230	.184	-.12	.99
Other Kinds Vegetables	Primary School	Secondary School	-.122	.212	1.000	-.64	.39
		Technical/University	-.293	.311	1.000	-1.05	.46
	Secondary School	Primary School	.122	.212	1.000	-.39	.64
		Technical/University	-.171	.310	1.000	-.92	.58
	Technical/ University	Primary School	.293	.311	1.000	-.46	1.05
		Secondary School	.171	.310	1.000	-.58	.92

Squash	Primary School	Secondary School	.107	.218	1.000	-.42	.64
		Technical/University	-.077	.320	1.000	-.85	.70
	Secondary School	Primary School	-.107	.218	1.000	-.64	.42
		Technical/University	-.184	.319	1.000	-.96	.59
	Technical/ University	Primary School	.077	.320	1.000	-.70	.85
		Secondary School	.184	.319	1.000	-.59	.96
Manioc	Primary School	Secondary School	**.590***	**.214**	**.020**	.07	1.11
		Technical/University	.413	.313	.568	-.35	1.17
	Secondary School	Primary School	**-.590***	**.214**	**.020**	-1.11	-.07
		Technical/University	-.177	.312	1.000	-.94	.58
	Technical/ University	Primary School	-.413	.313	.568	-1.17	.35
		Secondary School	.177	.312	1.000	-.58	.94
Potatoes	Primary School	Secondary School	.131	.235	1.000	-.44	.70
		Technical/University	-.183	.344	1.000	-1.02	.65
	Secondary School	Primary School	-.131	.235	1.000	-.70	.44
		Technical/University	-.314	.343	1.000	-1.15	.52
	Technical/ University	Primary School	.183	.344	1.000	-.65	1.02
		Secondary School	.314	.343	1.000	-.52	1.15

Rice	Primary School	Secondary School	.006	.136	1.000	-.32	.34
		Technical/University	.058	.199	1.000	-.43	.54
	Secondary School	Primary School	-.006	.136	1.000	-.34	.32
		Technical/University	.052	.199	1.000	-.43	.53
	Technical/ University	Primary School	-.058	.199	1.000	-.54	.43
		Secondary School	-.052	.199	1.000	-.53	.43
White Bread	Primary School	Secondary School	-1.344	1.182	.773	-4.21	1.53
		Technical/University	-.149	1.731	1.000	-4.35	4.05
	Secondary School	Primary School	1.344	1.182	.773	-1.53	4.21
		Technical/University	1.195	1.727	1.000	-3.0	5.39
	Technical/ University	Primary School	.149	1.731	1.000	-4.1	4.35
		Secondary School	-1.195	1.727	1.000	-5.39	3.00
Sopa Paraguaya	Primary School	Secondary School	-.039	.152	1.000	-.41	.33
		Technical/University	-.514	.223	.068	-1.06	.03
	Secondary School	Primary School	.039	.152	1.000	-.33	.41
		Technical/University	-.475	.222	.103	-1.01	.06
	Technical/ University	Primary School	.514	.223	.068	-.03	1.06
		Secondary School	.475	.222	.103	-.06	1.01

Mayonnaise	Primary School	Secondary School	-.052	.218	1.000	-.58	.48
		Technical/University	-.394	.320	.661	-1.17	.38
	Secondary School	Primary School	.052	.218	1.000	-.48	.58
		Technical/University	-.342	.319	.858	-1.12	.43
	Technical/ University	Primary School	.394	.320	.661	-.38	1.17
		Secondary School	.342	.319	.858	-.43	1.12
Asado	Primary School	Secondary School	.043	.122	1.000	-.25	.34
		Technical/University	-.024	.178	1.000	-.46	.41
	Secondary School	Primary School	-.043	.122	1.000	-.34	.25
		Technical/University	-.067	.178	1.000	-.50	.36
	Technical/ University	Primary School	.024	.178	1.000	-.41	.46
		Secondary School	.067	.178	1.000	-.36	.50
Arroz, Fideo	Primary School	Secondary School	-.030	.146	1.000	-.39	.32
		Technical/University	.135	.214	1.000	-.39	.65
	Secondary School	Primary School	.030	.146	1.000	-.32	.39
		Technical/University	.165	.214	1.000	-.35	.68
	Technical/ University	Primary School	-.135	.214	1.000	-.65	.39
		Secondary School	-.165	.214	1.000	-.68	.35

Milanesa	Primary School	Secondary School	.081	.178	1.000	-.35	.51
		Technical/University	-.043	.260	1.000	-.68	.59
	Secondary School	Primary School	-.081	.178	1.000	-.51	.35
		Technical/University	-.124	.260	1.000	-.75	.51
	Technical/ University	Primary School	.043	.260	1.000	-.59	.68
		Secondary School	.124	.260	1.000	-.51	.75
Tortillas	Primary School	Secondary School	-.006	.174	1.000	-.43	.42
		Technical/University	.317	.255	.648	-.30	.94
	Secondary School	Primary School	.006	.174	1.000	-.42	.43
		Technical/University	.323	.255	.621	-.30	.94
	Technical/ University	Primary School	-.317	.255	.648	-.94	.30
		Secondary School	-.323	.255	.621	-.94	.30
Vori Vori	Primary School	Secondary School	-.029	.159	1.000	-.41	.36
		Technical/University	.043	.233	1.000	-.52	.61
	Secondary School	Primary School	.029	.159	1.000	-.36	.41
		Technical/University	.072	.232	1.000	-.49	.64
	Technical/ University	Primary School	-.043	.233	1.000	-.61	.52
		Secondary School	-.072	.232	1.000	-.64	.49

Poroto	Primary School	Secondary School	**.488***	**.139**	**.002**	.15	.83
		Technical/University	.260	.203	.613	-.23	.75
	Secondary School	Primary School	**-.488***	**.139**	**.002**	-.83	-.15
		Technical/University	-.229	.203	.786	-.72	.26
	Technical/ University	Primary School	-.260	.203	.613	-.75	.23
		Secondary School	.229	.203	.786	-.26	.72
Hamburgers	Primary School	Secondary School	.037	.184	1.000	-.41	.48
		Technical/University	-.120	.269	1.000	-.77	.53
	Secondary School	Primary School	-.037	.184	1.000	-.48	.41
		Technical/University	-.157	.268	1.000	-.81	.49
	Technical/ University	Primary School	.120	.269	1.000	-.53	.77
		Secondary School	.157	.268	1.000	-.49	.81
Pizza	Primary School	Secondary School	.230	.170	.536	-.18	.64
		Technical/University	-.077	.249	1.000	-.68	.53
	Secondary School	Primary School	-.230	.170	.536	-.64	.18
		Technical/University	-.307	.248	.657	-.91	.30
	Technical/ University	Primary School	.077	.249	1.000	-.53	.68
		Secondary School	.307	.248	.657	-.30	.91

Croquettes, Empanadas	Primary School	Secondary School	-.413	.199	.120	-.90	.07
		Technical/University	-.154	.292	1.000	-.86	.55
	Secondary School	Primary School	.413	.199	.120	-.07	.90
		Technical/University	.259	.291	1.000	-.45	.97
	Technical/ University	Primary School	.154	.292	1.000	-.55	.86
		Secondary School	-.259	.291	1.000	-.97	.45
Peanuts, Popcorn, Cookies	Primary School	Secondary School	-.091	.227	1.000	-.64	.46
		Technical/University	-.202	.332	1.000	-1.01	.61
	Secondary School	Primary School	.091	.227	1.000	-.46	.64
		Technical/University	-.111	.332	1.000	-.92	.69
	Technical/ University	Primary School	.202	.332	1.000	-.61	1.01
		Secondary School	.111	.332	1.000	-.69	.92
Cake	Primary School	Secondary School	.251	.205	.672	-.25	.75
		Technical/University	.413	.300	.514	-.32	1.14
	Secondary School	Primary School	-.251	.205	.672	-.75	.25
		Technical/University	.163	.300	1.000	-.57	.89
	Technical/ University	Primary School	-.413	.300	.514	-1.14	.32
		Secondary School	-.163	.300	1.000	-.89	.57

Lettuce Salad	Primary School	Secondary School	.208	.203	.923	-.28	.70
		Technical/University	-.168	.297	1.000	-.89	.55
	Secondary School	Primary School	-.208	.203	.923	-.70	.28
		Technical/University	-.376	.297	.621	-1.10	.34
	Technical/ University	Primary School	.168	.297	1.000	-.55	.89
		Secondary School	.376	.297	.621	-.34	1.10
Rice, Potato Salad	Primary School	Secondary School	.026	.196	1.000	-.45	.50
		Technical/University	-.385	.287	.548	-1.08	.31
	Secondary School	Primary School	-.026	.196	1.000	-.50	.45
		Technical/University	-.410	.286	.464	-1.11	.29
	Technical/ University	Primary School	.385	.287	.548	-.31	1.08
		Secondary School	.410	.286	.464	-.29	1.11
Tereré, Mate	Primary School	Secondary School	-.142	.202	1.000	-.63	.35
		Technical/University	.168	.296	1.000	-.55	.89
	Secondary School	Primary School	.142	.202	1.000	-.35	.63
		Technical/University	.310	.296	.890	-.41	1.03
	Technical/ University	Primary School	-.168	.296	1.000	-.89	.55
		Secondary School	-.310	.296	.890	-1.03	.41

Cocido	Primary School	Secondary School	.159	.216	1.000	-.37	.68
		Technical/University	.298	.317	1.000	-.47	1.07
	Secondary School	Primary School	-.159	.216	1.000	-.68	.37
		Technical/University	.139	.316	1.000	-.63	.91
	Technical/ University	Primary School	-.298	.317	1.000	-1.07	.47
		Secondary School	-.139	.316	1.000	-.91	.63
Soda	Primary School	Secondary School	.014	.232	1.000	-.55	.58
		Technical/University	.188	.339	1.000	-.64	1.01
	Secondary School	Primary School	-.014	.232	1.000	-.58	.55
		Technical/University	.173	.338	1.000	-.65	.99
	Technical/ University	Primary School	-.188	.339	1.000	-1.01	.64
		Secondary School	-.173	.338	1.000	-.99	.65
Juice	Primary School	Secondary School	-.090	.192	1.000	-.56	.38
		Technical/University	-.226	.281	1.000	-.91	.46
	Secondary School	Primary School	.090	.192	1.000	-.38	.56
		Technical/University	-.136	.280	1.000	-.82	.54
	Technical/ University	Primary School	.226	.281	1.000	-.46	.91
		Secondary School	.136	.280	1.000	-.54	.82

Sugar	Primary School	Secondary School	-.009	.219	1.000	-.54	.52
		Technical/University	.288	.321	1.000	-.49	1.07
	Secondary School	Primary School	.009	.219	1.000	-.52	.54
		Technical/University	.297	.321	1.000	-.48	1.08
	Technical/ University	Primary School	-.288	.321	1.000	-1.07	.49
		Secondary School	-.297	.321	1.000	-1.08	.48
Sugar-free Substitute	Primary School	Secondary School	-.218	.231	1.000	-.78	.34
		Technical/University	-.702	.338	.119	-1.52	.12
	Secondary School	Primary School	.218	.231	1.000	-.34	.78
		Technical/University	-.483	.337	.462	-1.30	.33
	Technical/ University	Primary School	.702	.338	.119	-.12	1.52
		Secondary School	.483	.337	.462	-.33	1.30
French Fries	Primary School	Secondary School	.177	.126	.490	-.13	.48
		Technical/University	.279	.185	.405	-.17	.73
	Secondary School	Primary School	-.177	.126	.490	-.48	.13
		Technical/University	.101	.185	1.000	-.35	.55
	Technical/ University	Primary School	-.279	.185	.405	-.73	.17
		Secondary School	-.101	.185	1.000	-.55	.35

Hot Dogs	Primary School	Secondary School	.359	.189	.180	-.10	.82
		Technical/University	.144	.277	1.000	-.53	.82
	Secondary School	Primary School	-.359	.189	.180	-.82	.10
		Technical/University	-.215	.276	1.000	-.89	.46
	Technical/ University	Primary School	-.144	.277	1.000	-.82	.53
		Secondary School	.215	.276	1.000	-.46	.89
Fruit Salad	Primary School	Secondary School	.340	.200	.278	-.15	.83
		Technical/University	.457	.294	.367	-.26	1.17
	Secondary School	Primary School	-.340	.200	.278	-.83	.15
		Technical/University	.117	.293	1.000	-.59	.83
	Technical/ University	Primary School	-.457	.294	.367	-1.17	.26
		Secondary School	-.117	.293	1.000	-.83	.59
Honey	Primary School	Secondary School	.069	.196	1.000	-.41	.54
		Technical/University	.135	.287	1.000	-.56	.83
	Secondary School	Primary School	-.069	.196	1.000	-.54	.41
		Technical/University	.066	.287	1.000	-.63	.76
	Technical/ University	Primary School	-.135	.287	1.000	-.83	.56
		Secondary School	-.066	.287	1.000	-.76	.63

Oil, Butter	Primary School	Secondary School	-.136	.112	.674	-.41	.14
		Technical/University	-.168	.164	.918	-.57	.23
	Secondary School	Primary School	.136	.112	.674	-.14	.41
		Technical/University	-.032	.163	1.000	-.43	.36
	Technical/ University	Primary School	.168	.164	.918	-.23	.57
		Secondary School	.032	.163	1.000	-.36	.43
Salt	Primary School	Secondary School	-.116	.117	.970	-.40	.17
		Technical/University	.014	.172	1.000	-.40	.43
	Secondary School	Primary School	.116	.117	.970	-.17	.40
		Technical/University	.131	.172	1.000	-.29	.55
	Technical/ University	Primary School	-.014	.172	1.000	-.43	.40
		Secondary School	-.131	.172	1.000	-.55	.29
Ketchup	Primary School	Secondary School	-.138	.199	1.000	-.62	.35
		Technical/University	-.120	.292	1.000	-.83	.59
	Secondary School	Primary School	.138	.199	1.000	-.35	.62
		Technical/University	.018	.291	1.000	-.69	.72
	Technical/ University	Primary School	.120	.292	1.000	-.59	.83
		Secondary School	-.018	.291	1.000	-.72	.69

Pudding	Primary School	Secondary School	.105	.167	1.000	-.30	.51
		Technical/University	-.236	.245	1.000	-.83	.36
	Secondary School	Primary School	-.105	.167	1.000	-.51	.30
		Technical/University	-.341	.244	.495	-.93	.25
	Technical/ University	Primary School	.236	.245	1.000	-.36	.83
		Secondary School	.341	.244	.495	-.25	.93
Chipitas, Crackers	Primary School	Secondary School	-.042	.227	1.000	-.59	.51
		Technical/University	-.438	.332	.569	-1.24	.37
	Secondary School	Primary School	.042	.227	1.000	-.51	.59
		Technical/University	-.395	.331	.705	-1.20	.41
	Technical/ University	Primary School	.438	.332	.569	-.37	1.24
		Secondary School	.395	.331	.705	-.41	1.20

*. The mean difference is significant at the 0.05 level.

Table E.9

Independent Samples Children and Educational Attainment Test: Children in Primary School (First Group) versus Children in Secondary School (Second Group); significant values shown in ***bold.***

Food Item		Levene's Test		t-test for Equality of Means						
									95% CI	
		F	Sig.	t	df	Sig.	µd	SEM	Lower	Upper
Eggs	Equal σ^2	.888	.355	1.423	25	.167	.467	.328	-.209	1.143
	Not equal σ^2			1.420	24.6	.168	.467	.329	-.211	1.145
Milk	Equal σ^2	.593	.448	.530	25	.601	.170	.322	-.492	.833
	Not equal σ^2			.528	24.4	.602	.170	.323	-.495	.836
Yogurt	Equal σ^2	1.291	.267	1.319	25	.199	.626	.475	-.352	1.605
	Not equal σ^2			1.313	24.2	.201	.626	.477	-.358	1.610
Beef	Equal σ^2	**24.83**	**.000**	-1.812	25	.082	-.214	.118	-.458	.029
	Not equal σ^2			-1.883	13.0	.082	-.214	.114	-.460	.032
Chicken	Equal σ^2	0.336	.567	.068	25	.946	.022	.323	-.644	.688
	Not equal σ^2			.068	24.7	.946	.022	.321	-.640	.684
Sausage	Equal σ^2	.092	.764	-.874	25	.390	-.297	.339	-.996	.402
	Not equal σ^2			-.873	24.7	.391	-.297	.340	-.997	.404

Fruit	Equal σ²	.193	.664	.048	25	.962	.022	.460	-.925	.969
	Not equal σ²			.048	24.3	.962	.022	.461	-.930	.974
Green Pepper	Equal σ²	**11.586**	**.002**	1.037	25	.310	.511	.493	-.504	1.526
	Not equal σ²			1.022	20.6	.319	.511	.500	-.530	1.552
Tomatoes	Equal σ²	**13.04**	**.001**	1.657	25	.110	.385	.232	-.093	.863
	Not equal σ²			1.594	12.0	.137	.385	.241	-.141	.910
Onions	Equal σ²	.030	.864	.100	25	.921	.044	.439	-.861	.948
	Not equal σ²			.100	24.9	.921	.044	.439	-.860	.947
Other Kinds of Vegetables	Equal σ²	**4.646**	**.041**	-.566	25	.577	-.242	.427	-1.122	.639
	Not equal σ²			-.571	24.3	.573	-.242	.423	-1.115	.632
Squash	Equal σ²	.287	.597	-.202	25	.842	-.088	.436	-.986	.810
	Not equal σ²			-.203	24.7	.841	-.088	.433	-.980	.804
Manioc	Equal σ²	2.150	.155	1.196	25	.243	.527	.441	-.381	1.436
	Not equal σ²			1.186	23.2	.247	.527	.445	-.392	1.447
Potatoes	Equal σ²	1.587	.219	.518	25	.609	.253	.488	-.752	1.257
	Not equal σ²			.522	24.6	.606	.253	.484	-.745	1.250
Rice	Equal σ²	1.820	.189	-.766	25	.451	-.242	.316	-.892	.408
	Not equal σ²			-.784	19.3	.443	-.242	.308	-.887	.403
White Bread	Equal σ²	**4.849**	**.037**	-1.034	25	.311	-5.07	4.900	-15.16	5.026
	Not equal σ²			-0.995	12.0	.339	-5.07	5.093	-16.16	6.028
Sopa Paraguaya	Equal σ²	3.618	.069	-1.147	25	.262	-.434	.378	-1.214	.345
	Not equal σ²			-1.135	22.3	.268	-.434	.382	-1.227	.359

Mayonnaise	Equal σ^2	1.534	.227	-.100	25	.921	-.038	.383	-.827	.751
	Not equal σ^2			-.099	22.4	.922	-.038	.387	-.840	.764
Asado	Equal σ^2	.933	.343	.145	25	.886	.033	.227	-.434	.500
	Not equal σ^2			.144	22.7	.887	.033	.229	-.441	.507
Arroz or Fideo	Equal σ^2	.262	.613	.102	25	.920	.027	.270	-.529	.584
	Not equal σ^2			.104	21.6	.918	.027	.265	-.523	.578
Milanesa	Equal σ^2	3.279	.082	-.598	25	.555	-.253	.423	-1.123	.617
	Not equal σ^2			-.603	24.5	.552	-.253	.419	-1.117	.611
Tortillas	Equal σ^2	1.455	.239	.255	25	.801	.088	.345	-.622	.798
	Not equal σ^2			.258	23.4	.798	.088	.340	-.615	.791
Vori Vori	Equal σ^2	0.400	.533	-.274	25	.786	-.099	.361	-.842	.644
	Not equal σ^2			-.276	24.9	.785	-.099	.359	-.838	.640
Poroto	Equal σ^2	1.143	.295	.878	25	.389	.242	.276	-.326	.809
	Not equal σ^2			.873	23.8	.392	.242	.277	-.330	.814
Hamburger	Equal σ^2	1.102	.304	-.093	25	.927	-.038	.413	-.889	.812
	Not equal σ^2			-.094	24.7	.926	-.038	.410	-.883	.807
Pizza	Equal σ^2	.245	.625	1.508	25	.144	.582	.386	-.213	1.378
	Not equal σ^2			1.510	24.9	.144	.582	.386	-.212	1.377

Croquettes Empanada	Equal σ^2	0.254	.618	-1.090	25	.286	-.484	.444	-1.397	.430
	Not equal σ^2			-1.084	23.9	.289	-.484	.446	-1.404	.437
Peanuts, Popcorn, Cookies	Equal σ^2	1.695	.205	-.546	25	.590	-.253	.463	-1.206	.700
	Not equal σ^2			-.542	23.1	.593	-.253	.467	-1.218	.712
Cake	Equal σ^2	1.155	.293	0.562	25	.579	.253	.450	-.674	1.179
	Not equal σ^2			0.558	23.6	.582	.253	.453	-.682	1.188
Lettuce Salad	Equal σ^2	.025	.875	0.470	25	.643	.192	.410	-.651	1.036
	Not equal σ^2			.471	24.9	.642	.192	.409	-.649	1.034
Rice or Potato Salad	Equal σ^2	.458	.505	.111	25	.913	.044	.397	-.773	.861
	Not equal σ^2			.111	24.9	.912	.044	.395	-.769	.857
Terere or Mate	Equal σ^2	1.699	.204	-1.124	25	.272	-.577	.513	-1.634	.481
	Not equal σ^2			-1.128	24.9	.270	-.577	.511	-1.630	.476
Cocido	Equal σ^2	**6.984**	**.014**	1.247	25	.224	.401	.322	-.261	1.064
	Not equal σ^2			1.212	15.2	.244	.401	.331	-.304	1.106
Soda	Equal σ^2	**9.545**	**.005**	1.191	25	.245	.407	.341	-.296	1.109
	Not equal σ^2			1.158	15.5	.264	.407	.351	-.340	1.153
Juice	Equal σ^2	2.476	.128	-1.188	25	.246	-.390	.328	-1.066	.286
	Not equal σ^2			-1.217	19.1	.238	-.390	.321	-1.061	.281

Sugar	Equal σ^2	**24.83**	**.000**	-1.812	25	.082	-.643	.355	-1.374	.088
	Not equal σ^2			-1.883	13.0	.082	-.643	.341	-1.380	.095
Sugar Substitute	Equal σ^2	0.502	.485	-.329	25	.745	-.088	.267	-.638	.462
	Not equal σ^2			-.324	20.2	.749	-.088	.271	-.654	.478
French Fries	Equal σ^2	1.063	.312	.521	25	.607	.181	.348	-.536	.899
	Not equal σ^2			.526	24.2	.604	.181	.345	-.530	.893
Hot Dogs	Equal σ^2	**5.265**	**.030**	1.793	25	.085	.802	.447	-.119	1.724
	Not equal σ^2			1.818	23.2	.082	.802	.441	-.110	1.715
Fruit Salad	Equal σ^2	**5.598**	**.026**	1.450	25	.159	.538	.371	-.226	1.303
	Not equal σ^2			1.470	23.3	.155	.538	.366	-.219	1.296
Honey	Equal σ^2	.195	.662	.286	25	.777	.104	.365	-.647	.856
	Not equal σ^2			.286	24.7	.778	.104	.366	-.649	.858
Oil or Butter	Equal σ^2	**16.74**	**.000**	-1.561	25	.131	-.566	.362	-1.312	.181
	Not equal σ^2			-1.617	14.3	.128	-.566	.350	-1.315	.183
Salt	Equal σ^2	4.347	.047	-.962	25	.345	-.214	.223	-.673	.244
	Not equal σ^2			-1.000	13.0	.336	-.214	.214	-.677	.249
Ketchup	Equal σ^2	0.016	.900	-1.161	25	.257	-.456	.393	-1.265	.353
	Not equal σ^2			-1.159	24.6	.258	-.456	.394	-1.267	.355
Pudding	Equal σ^2	0.012	.915	1.072	25	.294	.330	.307	-.304	.963
	Not equal σ^2			1.065	23.5	.298	.330	.310	-.310	.969
Chipitas or Crackers	Equal σ^2	0.345	.562	.630	25	.535	.297	.471	-.674	1.267
	Not equal σ^2			.630	24.9	.534	.297	.471	-.673	1.267

Table E.10a

Analysis of Variance between Adults and their Educational Attainment: Primary School (First Group), Secondary School (Second Group), and Technical or University Degree (Third Group); significant values in ***bold.***

Food Items		Sum of Squares	df	Mean Square	F (Sig.)
Eggs	Between Groups	138.493	2	69.247	.674
	Within Groups	9342.624	91	102.666	(.512)
	Total	9481.117	93		
Milk	Between Groups	.229	2	.114	.281
	Within Groups	37.048	91	.407	(.756)
	Total	37.277	93		
Yogurt	Between Groups	3.693	2	1.846	1.149
	Within Groups	146.180	91	1.606	(.321)
	Total	149.872	93		
Beef	Between Groups	0.517	2	.259	.717
	Within Groups	32.813	91	.361	(.491)
	Total	33.330	93		
Chicken	Between Groups	.183	2	.092	.191
	Within Groups	43.742	91	.481	(.827)
	Total	43.926	93		
Sausage	Between Groups	1.850	2	0.925	1.184
	Within Groups	71.055	91	.781	(.311)
	Total	72.904	93		
Fruit	Between Groups	.001	2	.000	.000
	Within Groups	122.467	91	1.346	(1.000)
	Total	122.468	93		
Green Pepper	Between Groups	1.158	2	0.579	.479
	Within Groups	110.076	91	1.210	(.621)
	Total	111.234	93		
Tomatoes	Between Groups	.202	2	.101	.481
	Within Groups	19.117	91	.210	(.620)
	Total	19.319	93		
Onions	Between Groups	2.928	2	1.464	**3.302**
	Within Groups	40.349	91	.443	**(0.41)**
	Total	43.277	93		

Other Kinds Vegetables	Between Groups	0.280	2	.140	.121
	Within Groups	104.965	91	1.153	(.886)
	Total	105.245	93		
Squash	Between Groups	.734	2	.367	.309
	Within Groups	108.117	91	1.188	(.735)
	Total	108.851	93		
Manioc	Between Groups	7.722	2	3.861	**3.245**
	Within Groups	108.278	91	1.190	**(.044)**
	Total	116.000	93		
Potatoes	Between Groups	0.501	2	.251	.179
	Within Groups	127.499	91	1.401	(.836)
	Total	128.000	93		
Rice	Between Groups	.236	2	.118	.270
	Within Groups	39.817	91	.438	(.764)
	Total	40.053	93		
White Bread	Between Groups	0.509	2	0.254	.788
	Within Groups	29.406	91	0.323	(.458)
	Total	29.915	93		
Sopa Paraguaya	Between Groups	3.048	2	1.524	3.035
	Within Groups	45.686	91	.502	(.053)
	Total	48.734	93		
Mayonnaise	Between Groups	2.880	2	1.440	1.088
	Within Groups	120.492	91	1.324	(.341)
	Total	123.372	93		
Asado	Between Groups	.305	2	.153	.405
	Within Groups	34.248	91	.376	(.668)
	Total	34.553	93		
Arroz, Fideo	Between Groups	.137	2	.069	.120
	Within Groups	51.916	91	.571	(.887)
	Total	52.053	93		
Milanesa	Between Groups	.972	2	.486	.675
	Within Groups	65.581	91	.721	(.512)
	Total	66.553	93		
Tortillas	Between Groups	1.069	2	.535	.663
	Within Groups	73.367	91	.806	(.518)
	Total	74.436	93		
Vori Vori	Between Groups	.172	2	.086	.142
	Within Groups	55.232	91	.607	(.868)
	Total	55.404	93		

Poroto	Between Groups Within Groups Total	6.332 46.104 52.436	2 91 93	3.166 .507	**6.249 (.003)**
Hamburgers	Between Groups Within Groups Total	1.603 62.706 64.309	2 91 93	.801 .689	1.163 (.317)
Pizza	Between Groups Within Groups Total	0.879 62.738 63.617	2 91 93	.439 .689	.637 (.531)
Croquettes Empanadas	Between Groups Within Groups Total	3.102 87.749 90.851	2 91 93	1.551 0.964	1.609 (.206)
Peanuts, Popcorn, Cookies	Between Groups Within Groups Total	.686 121.867 122.553	2 91 93	.343 1.339	.256 (.775)
Cake	Between Groups Within Groups Total	1.297 89.692 90.989	2 91 93	0.649 0.986	.658 (.520)
Lettuce Salad	Between Groups Within Groups Total	1.208 89.728 90.936	2 91 93	0.604 0.986	.612 (.544)
Rice, Potato Salad	Between Groups Within Groups Total	2.311 92.328 94.638	2 91 93	1.155 1.015	1.139 (.325)
Tereré, Mate	Between Groups Within Groups Total	3.461 58.890 62.351	2 91 93	1.730 0.647	2.674 (.074)
Cocido	Between Groups Within Groups Total	0.310 124.541 124.851	2 91 93	.155 1.369	.113 (.893)
Soda	Between Groups Within Groups Total	.573 122.916 123.489	2 91 93	.286 1.351	.212 (.809)
Juice	Between Groups Within Groups Total	.439 94.806 95.245	2 91 93	.219 1.042	.211 (.811)
Sugar	Between Groups Within Groups Total	1.651 123.679 125.330	2 91 93	.825 1.359	.607 (.547)

Sugar-free Substitute	Between Groups	4.152	2	2.076	1.275
	Within Groups	148.199	91	1.629	(.285)
	Total	152.351	93		
French Fries	Between Groups	0.684	2	.342	1.150
	Within Groups	27.061	91	.297	(.321)
	Total	27.745	93		
Hot Dogs	Between Groups	1.037	2	0.518	.666
	Within Groups	70.836	91	.778	(.516)
	Total	71.872	93		
Fruit Salad	Between Groups	2.865	2	1.433	1.298
	Within Groups	100.411	91	1.103	(.278)
	Total	103.277	93		
Honey	Between Groups	.202	2	.101	.095
	Within Groups	96.617	91	1.062	(.909)
	Total	96.819	93		
Oil, Butter	Between Groups	.018	2	.009	.063
	Within Groups	13.301	91	.146	(.939)
	Total	13.319	93		
Salt	Between Groups	.203	2	.101	.269
	Within Groups	34.265	91	.377	(.764)
	Total	34.468	93		
Ketchup	Between Groups	.490	2	.245	.246
	Within Groups	90.616	91	0.996	(.782)
	Total	91.106	93		
Pudding	Between Groups	1.206	2	.603	.785
	Within Groups	69.911	91	.768	(.459)
	Total	71.117	93		
Chipitas, Crackers	Between Groups	3.817	2	1.909	1.466
	Within Groups	118.491	91	1.302	(.236)
	Total	122.309	93		

Table E.10b

Multiple Comparisons Educational Attainment for Adults only: Bonferroni Post-hoc

Dependent Variable	Groups		Mean D (I-J)	SE	Sig.	95% CI Lower	95% CI Upper
Eggs	Primary School	Secondary School	2.576	2.295	.794	-3.02	8.17
		Technical/University	2.151	3.020	1.000	-5.21	9.52
	Secondary School	Primary School	-2.576	2.295	.794	-8.17	3.02
		Technical/University	-.425	2.997	1.000	-7.74	6.89
	Technical/ University	Primary School	-2.151	3.020	1.000	-9.52	5.21
		Secondary School	.425	2.997	1.000	-6.89	7.74
Milk	Primary School	Secondary School	.016	.145	1.000	-.34	.37
		Technical/University	-.122	.190	1.000	-.59	.34
	Secondary School	Primary School	-.016	.145	1.000	-.37	.34
		Technical/University	-.138	.189	1.000	-.60	.32
	Technical/ University	Primary School	.122	.190	1.000	-.34	.59
		Secondary School	.138	.189	1.000	-.32	.60

Yogurt	Primary School	Secondary School	-.068	.287	1.000	-.77	.63
		Technical/University	-.556	.378	.434	-1.48	.37
	Secondary School	Primary School	.068	.287	1.000	-.63	.77
		Technical/University	-.488	.375	.590	-1.40	.43
	Technical/ University	Primary School	.556	.378	.434	-.37	1.48
		Secondary School	.488	.375	.590	-.43	1.40
Beef	Primary School	Secondary School	-.125	.136	1.000	-.46	.21
		Technical/University	.063	.179	1.000	-.37	.50
	Secondary School	Primary School	.125	.136	1.000	-.21	.46
		Technical/University	.188	.178	.882	-.25	.62
	Technical/ University	Primary School	-.063	.179	1.000	-.50	.37
		Secondary School	-.188	.178	.882	-.62	.25
Chicken	Primary School	Secondary School	.068	.157	1.000	-.31	.45
		Technical/University	.118	.207	1.000	-.39	.62
	Secondary School	Primary School	-.068	.157	1.000	-.45	.31
		Technical/University	.050	.205	1.000	-.45	.55
	Technical/ University	Primary School	-.118	.207	1.000	-.62	.39
		Secondary School	-.050	.205	1.000	-.55	.45

Sausage	Primary School	Secondary School	-.307	.200	.387	-.79	.18
		Technical/University	-.194	.263	1.000	-.84	.45
	Secondary School	Primary School	.307	.200	.387	-.18	.79
		Technical/University	.113	.261	1.000	-.53	.75
	Technical/ University	Primary School	.194	.263	1.000	-.45	.84
		Secondary School	-.113	.261	1.000	-.75	.53
Fruit	Primary School	Secondary School	.007	.263	1.000	-.63	.65
		Technical/University	.007	.346	1.000	-.84	.85
	Secondary School	Primary School	-.007	.263	1.000	-.65	.63
		Technical/University	.000	.343	1.000	-.84	.84
	Technical/ University	Primary School	-.007	.346	1.000	-.85	.84
		Secondary School	.000	.343	1.000	-.84	.84
Green Pepper	Primary School	Secondary School	.046	.249	1.000	-.56	.65
		Technical/University	-.266	.328	1.000	-1.07	.53
	Secondary School	Primary School	-.046	.249	1.000	-.65	.56
		Technical/University	-.313	.325	1.000	-1.11	.48
	Technical/ University	Primary School	.266	.328	1.000	-.53	1.07
		Secondary School	.313	.325	1.000	-.48	1.11

Tomatoes	Primary School	Secondary School	-.057	.104	1.000	-.31	.20
		Technical/University	-.132	.137	1.000	-.46	.20
	Secondary School	Primary School	.057	.104	1.000	-.20	.31
		Technical/University	-.075	.136	1.000	-.41	.26
	Technical/ University	Primary School	.132	.137	1.000	-.20	.46
		Secondary School	.075	.136	1.000	-.26	.41
Onions	Primary School	Secondary School	.349	.151	.069	-.02	.72
		Technical/University	-.026	.198	1.000	-.51	.46
	Secondary School	Primary School	-.349	.151	.069	-.72	.02
		Technical/University	-.375	.197	.180	-.86	.11
	Technical/ University	Primary School	.026	.198	1.000	-.46	.51
		Secondary School	.375	.197	.180	-.11	.86
Other Kinds Vegetables	Primary School	Secondary School	-.067	.243	1.000	-.66	.53
		Technical/University	-.155	.320	1.000	-.94	.63
	Secondary School	Primary School	.067	.243	1.000	-.53	.66
		Technical/University	-.087	.318	1.000	-.86	.69
	Technical/ University	Primary School	.155	.320	1.000	-.63	.94
		Secondary School	.087	.318	1.000	-.69	.86

Squash	Primary School	Secondary School	.193	.247	1.000	-.41	.80
		Technical/University	.118	.325	1.000	-.67	.91
	Secondary School	Primary School	-.193	.247	1.000	-.80	.41
		Technical/University	-.075	.322	1.000	-.86	.71
	Technical/ University	Primary School	-.118	.325	1.000	-.91	.67
		Secondary School	.075	.322	1.000	-.71	.86
Manioc	Primary School	Secondary School	**.617***	**.247**	**.043**	.01	1.22
		Technical/University	.467	.325	.463	-.33	1.26
	Secondary School	Primary School	**-.617***	**.247**	**.043**	-1.22	-.01
		Technical/University	-.150	.323	1.000	-.94	.64
	Technical/ University	Primary School	-.467	.325	.463	-1.26	.33
		Secondary School	.150	.323	1.000	-.64	.94
Potatoes	Primary School	Secondary School	.101	.268	1.000	-.55	.76
		Technical/University	-.099	.353	1.000	-.96	.76
	Secondary School	Primary School	-.101	.268	1.000	-.76	.55
		Technical/University	-.200	.350	1.000	-1.05	.65
	Technical/ University	Primary School	.099	.353	1.000	-.76	0.96
		Secondary School	.200	.350	1.000	-.65	1.05

Rice	Primary School	Secondary School	.093	.150	1.000	-.27	.46
		Technical/University	.118	.197	1.000	-.36	.60
	Secondary School	Primary School	-.093	.150	1.000	-.46	.27
		Technical/University	.025	.196	1.000	-.45	.50
	Technical/ University	Primary School	-.118	.197	1.000	-.60	.36
		Secondary School	-.025	.196	1.000	-.50	.45
White Bread	Primary School	Secondary School	-0.137	0.129	.872	-.45	0.18
		Technical/University	-.174	0.169	0.918	-.59	0.24
	Secondary School	Primary School	0.137	0.129	.872	-.18	0.45
		Technical/University	-0.038	0.168	1.000	-.45	0.37
	Technical/ University	Primary School	.174	0.169	0.918	-.24	0.59
		Secondary School	0.038	0.168	1.000	-.37	0.45
Sopa Paraguaya	Primary School	Secondary School	.101	.161	1.000	-.29	.49
		Technical/University	-.411	.211	.164	-.93	.10
	Secondary School	Primary School	-.101	.161	1.000	-.49	.29
		Technical/University	**-.513***	**.210**	**.049**	-1.02	.00
	Technical/ University	Primary School	.411	.211	.164	-.10	0.93
		Secondary School	**.513***	**.210**	**.049**	.00	1.02

Mayonnaise	Primary School	Secondary School	-.068	.261	1.000	-.70	.57
		Technical/University	-.493	.343	.461	-1.33	.34
	Secondary School	Primary School	.068	.261	1.000	-.57	.70
		Technical/University	-.425	.340	.645	-1.26	.41
	Technical/ University	Primary School	.493	.343	.461	-.34	1.33
		Secondary School	.425	.340	.645	-.41	1.26
Asado	Primary School	Secondary School	.034	.139	1.000	-.30	.37
		Technical/University	-.128	.183	1.000	-.57	.32
	Secondary School	Primary School	-.034	.139	1.000	-.37	.30
		Technical/University	-.163	.181	1.000	-.61	.28
	Technical/ University	Primary School	.128	.183	1.000	-.32	.57
		Secondary School	.163	.181	1.000	-.28	.61
Arroz, Fideo	Primary School	Secondary School	-.061	.171	1.000	-.48	.36
		Technical/University	.039	.225	1.000	-.51	.59
	Secondary School	Primary School	.061	.171	1.000	-.36	.48
		Technical/University	.100	.223	1.000	-.44	.64
	Technical/ University	Primary School	-.039	.225	1.000	-.59	.51
		Secondary School	-.100	.223	1.000	-.64	.44

Milanesa	Primary School	Secondary School	.188	.192	0.991	-.28	.66
		Technical/University	-.049	.253	1.000	-.67	.57
	Secondary School	Primary School	-.188	.192	0.991	-.66	.28
		Technical/University	-.238	.251	1.000	-.85	.37
	Technical/ University	Primary School	.049	.253	1.000	-.57	.67
		Secondary School	.238	.251	1.000	-.37	.85
Tortillas	Primary School	Secondary School	-.043	.203	1.000	-.54	.45
		Technical/University	.257	.268	1.000	-.40	.91
	Secondary School	Primary School	.043	.203	1.000	-.45	.54
		Technical/University	.300	.266	.785	-.35	.95
	Technical/ University	Primary School	-.257	.268	1.000	-.91	.40
		Secondary School	-.300	.266	.785	-.95	.35
Vori Vori	Primary School	Secondary School	.003	.176	1.000	-.43	.43
		Technical/University	.115	.232	1.000	-.45	.68
	Secondary School	Primary School	-.003	.176	1.000	-.43	.43
		Technical/University	.113	.230	1.000	-.45	.67
	Technical/ University	Primary School	-.115	.232	1.000	-.68	.45
		Secondary School	-.113	.230	1.000	-.67	.45

Poroto	Primary School	Secondary School	**.570***	**.161**	**.002**	.18	.96
		Technical/University	.270	.212	.620	-.25	.79
	Secondary School	Primary School	**-.570***	**.161**	**.002**	-.96	-.18
		Technical/University	-.300	.211	.473	-.81	.21
	Technical/ University	Primary School	-.270	.212	.620	-.79	.25
		Secondary School	.300	.211	.473	-.21	.81
Hamburgers	Primary School	Secondary School	.037	.188	1.000	-.42	.50
		Technical/University	-.326	.247	0.574	-.93	.28
	Secondary School	Primary School	-.037	.188	1.000	-.50	.42
		Technical/University	-.363	.246	0.430	-.96	.24
	Technical/ University	Primary School	.326	.247	0.574	-.28	.93
		Secondary School	.363	.246	0.430	-.24	.96
Pizza	Primary School	Secondary School	.104	.188	1.000	-.35	.56
		Technical/University	-.171	.247	1.000	-.77	.43
	Secondary School	Primary School	-.104	.188	1.000	-.56	.35
		Technical/University	-.275	.246	.797	-.87	.32
	Technical/ University	Primary School	.171	.247	1.000	-.43	.77
		Secondary School	.275	.246	.797	-.32	.87

Croquettes, Empanadas	Primary School	Secondary School	-.399	.222	.229	-.94	.14
		Technical/University	-.224	.293	1.000	-.94	.49
	Secondary School	Primary School	.399	.222	.229	-.14	.94
		Technical/University	.175	.290	1.000	-.53	.88
	Technical/ University	Primary School	.224	.293	1.000	-.49	.94
		Secondary School	-.175	.290	1.000	-.88	.53
Peanuts, Popcorn, Cookies	Primary School	Secondary School	-.043	.262	1.000	-.68	.60
		Technical/University	-.243	.345	1.000	-1.08	.60
	Secondary School	Primary School	.043	.262	1.000	-.60	.68
		Technical/University	-.200	.342	1.000	-1.03	.63
	Technical/ University	Primary School	.243	.345	1.000	-.60	1.08
		Secondary School	.200	.342	1.000	-.63	1.03
Cake	Primary School	Secondary School	.232	.225	.918	-.32	.78
		Technical/University	.257	.296	1.000	-.47	0.98
	Secondary School	Primary School	-.232	.225	.918	-.78	.32
		Technical/University	.025	.294	1.000	-.69	.74
	Technical/ University	Primary School	-.257	.296	1.000	-.98	.47
		Secondary School	-.025	.294	1.000	-.74	.69

Lettuce Salad	Primary School	Secondary School	.236	.225	.894	-.31	.78
		Technical/University	.023	.296	1.000	-.70	.74
	Secondary School	Primary School	-.236	.225	.894	-.78	.31
		Technical/University	-.213	.294	1.000	-.93	.50
	Technical/ University	Primary School	-.023	.296	1.000	-.74	.70
		Secondary School	.213	.294	1.000	-.50	0.93
Rice, Potato Salad	Primary School	Secondary School	.017	.228	1.000	-.54	.57
		Technical/University	-.408	.300	.533	-1.14	.32
	Secondary School	Primary School	-.017	.228	1.000	-.57	.54
		Technical/University	-.425	.298	.472	-1.15	.30
	Technical/ University	Primary School	.408	.300	.533	-.32	1.14
		Secondary School	.425	.298	.472	-.30	1.15
Tereré, Mate	Primary School	Secondary School	.042	.182	1.000	-.40	.49
		Technical/University	.530	.240	0.089	-.06	1.11
	Secondary School	Primary School	-.042	.182	1.000	-.49	.40
		Technical/University	.488	.238	.130	-.09	1.07
	Technical/ University	Primary School	-.530	.240	0.089	-1.11	.06
		Secondary School	-.488	.238	.130	-1.07	.09

Cocido	Primary School	Secondary School	.064	.265	1.000	-.58	.71
		Technical/University	.164	.349	1.000	-.69	1.01
	Secondary School	Primary School	-.064	.265	1.000	-.71	.58
		Technical/University	.100	.346	1.000	-.74	.94
	Technical/ University	Primary School	-.164	.349	1.000	-1.01	.69
		Secondary School	-.100	.346	1.000	-.94	.74
Soda	Primary School	Secondary School	-.155	.263	1.000	-.80	.49
		Technical/University	-.168	.346	1.000	-1.01	0.68
	Secondary School	Primary School	.155	.263	1.000	-.49	.80
		Technical/University	-.013	.344	1.000	-.85	.83
	Technical/ University	Primary School	.168	.346	1.000	-.68	1.01
		Secondary School	.013	.344	1.000	-.83	.85
Juice	Primary School	Secondary School	.013	.231	1.000	-.55	.58
		Technical/University	-.174	.304	1.000	-.92	.57
	Secondary School	Primary School	-.013	.231	1.000	-.58	.55
		Technical/University	-.188	.302	1.000	-.92	.55
	Technical/ University	Primary School	.174	.304	1.000	-.57	.92
		Secondary School	.188	.302	1.000	-.55	.92

Sugar	Primary School	Secondary School	.205	.264	1.000	-.44	.85
		Technical/University	.355	.347	0.928	-.49	1.20
	Secondary School	Primary School	-.205	.264	1.000	-.85	.44
		Technical/University	.150	.345	1.000	-.69	0.99
	Technical/ University	Primary School	-.355	.347	0.928	-1.20	.49
		Secondary School	-.150	.345	1.000	-.99	.69
Sugar-free Substitute	Primary School	Secondary School	-.249	.289	1.000	-.95	.46
		Technical/University	-.599	.380	.357	-1.53	.33
	Secondary School	Primary School	.249	.289	1.000	-.46	.95
		Technical/University	-.350	.377	1.000	-1.27	.57
	Technical/ University	Primary School	.599	.380	.357	-.33	1.53
		Secondary School	.350	.377	1.000	-.57	1.27
French Fries	Primary School	Secondary School	.166	.124	.549	-.14	.47
		Technical/University	.191	.163	.730	-.21	.59
	Secondary School	Primary School	-.166	.124	.549	-.47	.14
		Technical/University	.025	.161	1.000	-.37	.42
	Technical/ University	Primary School	-.191	.163	.730	-.59	.21
		Secondary School	-.025	.161	1.000	-.42	.37

Hot Dogs	Primary School	Secondary School	.191	.200	1.000	-.30	.68
		Technical/University	-.059	.263	1.000	-.70	.58
	Secondary School	Primary School	-.191	.200	1.000	-.68	.30
		Technical/University	-.250	.261	1.000	-.89	.39
	Technical/ University	Primary School	.059	.263	1.000	-.58	.70
		Secondary School	.250	.261	1.000	-.39	.89
Fruit Salad	Primary School	Secondary School	.276	.238	.746	-.30	.86
		Technical/University	.464	.313	.426	-.30	1.23
	Secondary School	Primary School	-.276	.238	.746	-.86	.30
		Technical/University	.188	.311	1.000	-.57	.95
	Technical/ University	Primary School	-.464	.313	.426	-1.23	.30
		Secondary School	-.188	.311	1.000	-.95	.57
Honey	Primary School	Secondary School	.057	.233	1.000	-.51	.63
		Technical/University	.132	.307	1.000	-.62	.88
	Secondary School	Primary School	-.057	.233	1.000	-.63	.51
		Technical/University	.075	.305	1.000	-.67	.82
	Technical/ University	Primary School	-.132	.307	1.000	-.88	.62
		Secondary School	-.075	.305	1.000	-.82	.67

Oil, Butter	Primary School	Secondary School	.021	.087	1.000	-.19	.23
		Technical/University	-.016	.114	1.000	-.29	.26
	Secondary School	Primary School	-.021	.087	1.000	-.23	.19
		Technical/University	-.038	.113	1.000	-.31	.24
	Technical/ University	Primary School	.016	.114	1.000	-.26	.29
		Secondary School	.038	.113	1.000	-.24	.31
Salt	Primary School	Secondary School	-.083	.139	1.000	-.42	.26
		Technical/University	.030	.183	1.000	-.42	.48
	Secondary School	Primary School	.083	.139	1.000	-.26	.42
		Technical/University	.113	.182	1.000	-.33	.56
	Technical/ University	Primary School	-.030	.183	1.000	-.48	.42
		Secondary School	-.113	.182	1.000	-.56	.33
Ketchup	Primary School	Secondary School	-.045	.226	1.000	-.60	.51
		Technical/University	-.207	.297	1.000	-.93	.52
	Secondary School	Primary School	.045	.226	1.000	-.51	.60
		Technical/University	-.163	.295	1.000	-.88	.56
	Technical/ University	Primary School	.207	.297	1.000	-.52	.93
		Secondary School	.163	.295	1.000	-.56	.88

Pudding	Primary School	Secondary School	.026	.199	1.000	-.46	.51
		Technical/University	-.286	.261	0.828	-.92	.35
	Secondary School	Primary School	-.026	.199	1.000	-.51	.46
		Technical/University	-.313	.259	.694	-.94	.32
	Technical/ University	Primary School	.286	.261	0.828	-.35	.92
		Secondary School	.313	.259	.694	-.32	.94
Chipitas, Crackers	Primary School	Secondary School	-.170	.258	1.000	-.80	.46
		Technical/University	-.582	.340	.271	-1.41	.25
	Secondary School	Primary School	.170	.258	1.000	-.46	.80
		Technical/University	-.413	.338	.675	-1.24	.41
	Technical/ University	Primary School	.582	.340	.271	-.25	1.41
		Secondary School	.413	.338	.675	-.41	1.24

*. The mean difference is significant at the 0.05 level.

Table E.11a

Ordinal Logit Regression: Predicting BMI by dietary consumption

Model Fitting Information				
Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	50.451			
Final	50.320	.131	3	.988
Goodness-of-Fit				
		Chi-Square	df	Sig.
Pearson		6.682	11	.824
Deviance		7.032	11	.796
Pseudo R-Square				
Cox and Snell		.001		
Nagelkerke		.001		
McFadden		.001		

Table E.11b

Coefficients: Parameter Estimates from ordinal logit regression

		Estimate	Std. Error	Wald	df	Sig.	95% CI Lower	95% CI Upper
Threshold	Normal Weight	-.935	.309	9.148	1	.002	-1.541	-.329
	Overweight	.214	.297	.519	1	.471	-.368	.796
Location	Low Consumption of Carbohydrates	.058	.384	.023	1	.880	-.694	.811
	High Consumption of Carbohydrates	0[a]			0			
	Low Consumption of Fruits	.027	.358	.006	1	.941	-.675	.729
	High Consumption of Fruits	0[a]			0			
	Low Consumption of Energy Beverages	-.133	.374	.126	1	.722	-.866	.600
	High Consumption of Energy Beverages	0[a]			0			

a. This parameter is set to zero because it is redundant.

Table E.12

Independent Samples Household Income Test: Lower Income Households (First Group) versus Higher Income Households (Second Group)

Food Groups		Levene's Test		t-test for Equality of Means						
									95% CI	
		F	Sig.	t	df	Sig.	µd	SEM	Lower	Upper
Total Dietary Variety	Equal σ^2	0.197	0.659	0.342	66	0.733	.011	0.033	-0.054	0.077
	Not equal σ^2			0.331	47.3	0.742	.011	0.034	-0.057	0.080
Condiment	Equal σ^2	0.130	0.719	0.438	66	0.663	.016	0.036	-0.057	0.089
	Not equal σ^2			0.443	55.1	0.660	.016	0.036	-0.056	0.088
Dairy	Equal σ^2	1.905	0.172	1.824	66	0.073	.225	0.124	-0.021	0.472
	Not equal σ^2			1.838	54.4	0.072	.225	0.123	-0.020	0.471
Energy-Containing Beverages	Equal σ^2	0.147	0.703	-0.751	66	0.455	-.028	0.038	-0.103	0.047
	Not equal σ^2			-0.774	58.1	0.442	-.028	0.036	-0.101	0.045
Lunch, Dinner Entrees	Equal σ^2	1.446	0.234	-0.177	66	0.860	-.008	0.048	-0.104	0.087
	Not equal σ^2			-0.170	46.6	0.865	-.008	0.050	-0.108	0.091
Sweets, Snacks, Carbohydrates	Equal σ^2	0.076	0.783	0.097	66	0.923	.005	0.047	-0.090	0.099
	Not equal σ^2			0.095	50.3	0.925	.005	0.048	-0.092	0.101
Fruits, Vegetables	Equal σ^2	0.039	0.843	1.062	66	0.292	.047	0.044	-0.042	0.136
	Not equal σ^2			1.041	49.7	0.303	.047	0.045	-0.044	0.138

Table E.13

Independent T-test of Dietary Variety by Households that Shop at a Supermarket versus another Store Type

Food Groups		Levene's Test		t-test for Equality of Means						
									95% CI	
		F	Sig.	t	df	Sig.	µd	SEM	Lower	Upper
Total Dietary Variety	Equal σ^2	**5.072**	**0.028**	-.899	66	0.372	-.030	.033	-0.096	0.036
	Not equal σ^2			-.800	35.4	0.429	-.030	.037	-0.105	0.046
Condiment	Equal σ^2	1.768	0.188	-1.771	66	0.081	-.064	.036	-0.135	0.008
	Not equal σ^2			-1.65	40.4	0.107	-.064	.039	-0.142	0.014
Dairy	Equal σ^2	0.045	0.833	-.431	66	0.668	-.055	.127	-0.309	0.199
	Not equal σ^2			-.430	49.9	0.669	-.055	.128	-0.312	0.202
Energy-Containing Beverages	Equal σ^2	0.742	0.392	.338	66	0.736	.013	.038	-0.063	0.089
	Not equal σ^2			.311	39.1	0.757	.013	.041	-0.071	0.096
Lunch, Dinner Entrees	Equal σ^2	**10.984**	**0.001**	-1.305	66	0.196	-.062	.047	-0.157	0.033
	Not equal σ^2			-1.133	32.9	0.265	-.062	.055	-0.173	0.049
Sweets, Snacks, Carbohydrates	Equal σ^2	0.721	0.399	-.153	66	0.879	-.007	.048	-0.102	0.088
	Not equal σ^2			-.144	42.2	0.886	-.007	.050	-0.109	0.094
Fruits, Vegetables	Equal σ^2	0.228	0.635	-.098	66	0.922	-.004	.045	-0.095	0.086
	Not equal σ^2			-.096	47.6	0.924	-.004	.046	-0.097	0.088

Table E.14a

Model Summary: Predictors of BMI by Store Ranks and Weighted by Household Size

Model	Primary Store Ranks	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	Availability	.009[a]	0.000	-0.016	13.447
2	Affordability	.012[b]	0.000	-0.032	13.554
3	Quality	.025[c]	0.001	-0.049	13.662

a. Predictors: (Constant), Store Availability Rank
b. Predictors: (Constant), Store Availability Rank, Store Affordability Rank
c. Predictors: (Constant), Store Availability Rank, Store Affordability Rank, Store Quality Rank

Table E.14b

Analysis of Variance: Regression Models of BMI Predicted by Store Ranks

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.88955	1	0.88955	0.005	0.944[a]
	Residual	11391.5	63	180.817		
	Total	11392.4	64			
2	Regression	1.54774	2	0.77387	0.004	0.996[b]
	Residual	11390.8	62	183.723		
	Total	11392.4	64			
3	Regression	7.24018	3	2.41339	0.013	0.998[c]
	Residual	11385.1	61	186.641		
	Total	11392.4	64			

a. Predictors: (Constant), Store Availability Rank
b. Predictors: (Constant), Store Availability Rank, Store Affordability Rank
c. Predictors: (Constant), Store Availability Rank, Store Affordability Rank, Store Quality Rank

Table E.14c

Table of Coefficients: Predicting BMI Weighted by Household Size

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	28.462	2.880		9.884	0.000
	Availability	-0.015	0.210	-0.009	-.070	0.944
2	(Constant)	28.707	5.007		5.733	0.000
	Availability	-0.027	0.290	-0.016	-.092	0.927
	Affordability	-0.015	0.244	-0.010	-.060	0.952
3	(Constant)	29.052	5.420		5.360	0.000
	Availability	-0.037	0.298	-0.022	-.124	0.902
	Affordability	0.043	0.410	0.030	.104	0.918
	Quality	-0.071	0.407	-0.051	-.175	0.862

Table E.14d

Excluded Variables: Predicting BMI Weighted by Household Size

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	Affordability[a]	-.010	-.060	.952	-.008	.531
	Quality[a]	-.027	-.154	.878	-.020	.542
2	Quality[b]	-.051	-.175	.862	-.022	.196

a. Predictors in the Model: (Constant), Store Availability Rank
b. Predictors in the Model: (Constant), Store Availability Rank, Store Affordability Rank

Table E.15a

Model Summary: Predictors of BMI by Store Ranks and Weighted by Household Income

Model	Primary Store Ranks	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	Availability	.006[a]	0.000	-0.016	9139.551
2	Affordability	.021[b]	0.000	-0.032	9211.133
3	Quality	.144[c]	0.021	-0.028	9191.936

a. Predictors: (Constant), Store Availability Rank
b. Predictors: (Constant), Store Availability Rank, Store Affordability Rank
c. Predictors: (Constant), Store Availability Rank, Store Affordability Rank, Store Quality Rank

Table E.15b

Analysis of Variance: Regression Models of BMI Predicted by Store Ranks

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.702E+05	1	1.702E+05	.00204	.964[a]
	Residual	5.262E+09	63	8.353E+07		
	Total	5.263E+09	64			
2	Regression	2.260E+06	2	1.130E+06	.01332	.987[b]
	Residual	5.260E+09	62	8.484E+07		
	Total	5.263E+09	64			
3	Regression	1.087E+08	3	3.622E+07	.42866	.733[c]
	Residual	5.154E+09	61	8.449E+07		
	Total	5.263E+09	64			

a. Predictors: (Constant), Store Availability Rank
b. Predictors: (Constant), Store Availability Rank, Store Affordability Rank
c. Predictors: (Constant), Store Availability Rank, Store Affordability Rank, Store Quality Rank

Table E.15c

Table of Coefficients: Predicting BMI Weighted by Household Income

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	29.528	3.288		8.980	0.000
	Availability	-0.010	0.230	-0.006	-0.045	0.964
2	(Constant)	30.740	8.404		3.658	0.001
	Availability	-0.076	0.477	-0.042	-0.159	0.874
	Affordability	-0.057	0.361	-0.041	-0.157	0.876
3	(Constant)	33.762	8.809		3.833	0.000
	Availability	-0.184	0.486	-0.101	-0.379	0.706
	Affordability	0.450	0.578	0.326	0.779	0.439
	Quality	-0.575	0.513	-0.444	-1.122	0.266

Table E.15d

Excluded Variables: Predicting BMI Weighted by Household Income

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	Affordability[a]	-0.041	-0.157	0.876	-0.020	0.235
	Quality[a]	-0.203	-0.826	0.412	-0.104	0.264
2	Quality[b]	-0.444	-1.122	0.266	-0.142	0.103

a. Predictors in the Model: (Constant), Store Availability Rank
b. Predictors in the Model: (Constant), Store Availability Rank, Store Affordability Rank