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The Nutrition Transition Among the Andean Kichwas of Ecuador

Vanessa Alicia Chee

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The Nutrition Transition Among the Andean Kichwas of Ecuador

by

Vanessa Alicia Chee

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy
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Keywords: Kichwas, Geo-Nomics Theory and Framework, Mixed Methods, Global Nutrition, Nutrition Transition Questionnaire, Lifestyle Assessment

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Dedication

I would like to dedicate this work to my parents, Joan and Lawrence Chee, without whose love, support and sacrifice I would not have made it this far. Thank you both for loving and supporting me throughout this journey.
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I wish to thank all members of my committee: Drs. Dina Martinez-Tyson, Lauri Wright, Cheryl Vamos, Enrique Teran, David Himmelgreen, Robert Dedrick, whose wisdom and guidance throughout this process were essential. I learned a great deal throughout this journey with you and I am thankful to you all for the time you each invested to help me graduate.

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Table of Contents

List of Tables ........................................................................................................................................ vi
List of Figures ...................................................................................................................................... vii
Abstract .............................................................................................................................................. viii

Chapter 1. Introduction .......................................................................................................................... 1
  Introduction to this Dissertation ................................................................................................ 1
  Genesis of the Current Study ..................................................................................................... 1
  Research Setting ........................................................................................................................ 3
  Kichwas Indigenous Identity in the Research Setting ............................................................... 6
  Positionality............................................................................................................................... 6
  Research Rationale and Significance ...................................................................................... 10
    Study aims................................................................................................................................. 11
  Definition of Terms ................................................................................................................. 12
  Organization of this Dissertation............................................................................................. 15

Chapter 2. Background and Literature Review .................................................................................... 17
  Introduction ............................................................................................................................. 17
  Kichwas Origins, History and Culture .................................................................................... 17
  The Current State of the Global Nutrition Transition ............................................................. 19
  Ecuador’s Current Nutritional Situation .................................................................................. 20
  Ecuador’s Economy................................................................................................................. 23
  Economic Development and the Nutritional Situation in Ecuador ........................................... 24
  Urbanization, globalization, economic development and the nutrition transition .......... 25
  Factors that affect Food Choices ............................................................................................. 26
  Public Health Perspectives on the Process of Food Choice ................................................... 27
    Anthropological Perspectives on the Process of Food Choice ........................................... 27
      Food signification ............................................................................................................... 28
      Tastes of luxury versus necessity ..................................................................................... 29
      The McDonaldization of Society ...................................................................................... 29
    Nutrition Perspectives on the Process of Food Choice ....................................................... 31
  Factors Affecting Food Choices among Indigenous Groups ................................................... 33
  Dietary Patterns, the Nutrition Transition and Economic Development ......................... 35
  Antecedents of the Nutrition Transition among the Indigenous Population ................. 36
  Nutrition Transition Impact on Health in General.............................................................. 40
  Public Health Significance of The Nutrition Transition ....................................................... 42
  Historical Milestones of the Nutrition Transition ................................................................. 43
  Global and Regional Priorities and Milestones regarding Chronic Disease .................... 45
    Economic ramifications of the nutrition transition ............................................................ 46
    The Public Health Significance of the Nutrition Transition
<table>
<thead>
<tr>
<th>Chapter 5. Results ................................................................................................................................</th>
<th>83</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction ................................................................................................................................................</td>
<td>83</td>
</tr>
<tr>
<td>Quantitative Results....................................................................................................................................</td>
<td>83</td>
</tr>
<tr>
<td>Nutrition Transition Questionnaire demographics .........................................................................................</td>
<td>83</td>
</tr>
<tr>
<td>Chronic disease, obesity and oral health .....................................................................................................</td>
<td>83</td>
</tr>
<tr>
<td>Individual risk ............................................................................................................................................</td>
<td>87</td>
</tr>
<tr>
<td>Individual resilience .....................................................................................................................................</td>
<td>87</td>
</tr>
<tr>
<td>Nutrition Transition Questionnaire salience and content validity .............................................................</td>
<td>87</td>
</tr>
<tr>
<td>General correlations .....................................................................................................................................</td>
<td>89</td>
</tr>
<tr>
<td>Qualitative Results .......................................................................................................................................</td>
<td>90</td>
</tr>
<tr>
<td>General Dietary Trends among the Kichwas People .......................................................................................</td>
<td>91</td>
</tr>
<tr>
<td>Lifestyle Risk Factors among the Kichwas ..................................................................................................</td>
<td>92</td>
</tr>
<tr>
<td>Sunflower Oil Consumption .........................................................................................................................</td>
<td>92</td>
</tr>
<tr>
<td>Impact of geology, geography and ecology ..................................................................................................</td>
<td>92</td>
</tr>
<tr>
<td>Environment contributes to both risk and resilience ....................................................................................</td>
<td>93</td>
</tr>
<tr>
<td>Thermoses for packed lunch .......................................................................................................................</td>
<td>94</td>
</tr>
<tr>
<td>Child food preferences ..................................................................................................................................</td>
<td>95</td>
</tr>
<tr>
<td>Soda consumption .........................................................................................................................................</td>
<td>95</td>
</tr>
<tr>
<td>Health Outcomes associated with the Nutrition Transition among the Kichwas ................................................</td>
<td>96</td>
</tr>
<tr>
<td>Gender Roles, Culinary Traditions and Dietary Behavior ..............................................................................</td>
<td>96</td>
</tr>
<tr>
<td>Food is a woman’s work ...............................................................................................................................</td>
<td>96</td>
</tr>
<tr>
<td>Role of men in food .......................................................................................................................................</td>
<td>96</td>
</tr>
<tr>
<td>Mingas ..........................................................................................................................................................</td>
<td>97</td>
</tr>
<tr>
<td>Food choice heuristics ...................................................................................................................................</td>
<td>98</td>
</tr>
<tr>
<td>Kichwas-Mestizo/Foreigner tension and cultural barriers ...............................................................................</td>
<td>99</td>
</tr>
<tr>
<td>Dietary trends and risks ...............................................................................................................................</td>
<td>100</td>
</tr>
<tr>
<td>Intergenerational differences and culinary traditions ..................................................................................</td>
<td>100</td>
</tr>
<tr>
<td>Home-made meals and general food choice trends .....................................................................................</td>
<td>101</td>
</tr>
<tr>
<td>Urbanization, Globalization, and Kichwas Lifestyle Patterns .......................................................................</td>
<td>102</td>
</tr>
<tr>
<td>Protective/Resilient Health Beliefs, Behaviors and Practices ......................................................................</td>
<td>103</td>
</tr>
<tr>
<td>Bio-economic system tied to horticultural way of life ..................................................................................</td>
<td>103</td>
</tr>
<tr>
<td>Fruits and vegetables are a way of life ..........................................................................................................</td>
<td>104</td>
</tr>
<tr>
<td>Environmental safety, physical activity and the biocultural role of pets .....................................................</td>
<td>105</td>
</tr>
<tr>
<td>Organic food consciousness .......................................................................................................................</td>
<td>106</td>
</tr>
<tr>
<td>Fast food consumption ...............................................................................................................................</td>
<td>106</td>
</tr>
<tr>
<td>Ethical Issues and Solutions .......................................................................................................................</td>
<td>81</td>
</tr>
<tr>
<td>Methods Summary .........................................................................................................................................</td>
<td>82</td>
</tr>
<tr>
<td>Appendix</td>
<td>Title</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>A</td>
<td>Author’s permission to reproduce image on page 48</td>
</tr>
<tr>
<td>B</td>
<td>Global burden of disease study data 2013</td>
</tr>
<tr>
<td>C</td>
<td>Constructs within the Food Choice Process Model</td>
</tr>
<tr>
<td>D</td>
<td>Syndemic Theory applied to data analysis regarding the Nutrition Transition</td>
</tr>
<tr>
<td>E</td>
<td>Nutrition Transition Questionnaire (NTQ) English</td>
</tr>
<tr>
<td>F</td>
<td>Nutrition Transition Questionnaire (NTQ) Spanish</td>
</tr>
<tr>
<td>G</td>
<td>English Informed Consent Form</td>
</tr>
<tr>
<td>H</td>
<td>Spanish Informed Consent Form</td>
</tr>
<tr>
<td>I</td>
<td>Bilingual Semi-Structured Interview Debriefing Template</td>
</tr>
<tr>
<td>J</td>
<td>IRB Approval Letter Ecuador</td>
</tr>
<tr>
<td>K</td>
<td>IRB Approval Letter USF</td>
</tr>
<tr>
<td>L</td>
<td>Revised Nutrition Transition Questionnaire</td>
</tr>
</tbody>
</table>
**List of Tables**

Table 1.1a  Ecuador Population Statistics ...............................................................21  
Table 1.1b  Historical milestones regarding the Nutrition Transition .........................45  
Table 4.1  Sampling strategies for current mixed methods study .................................65  
Table 4.2a  Overview of the NTQ instrument development and analysis process ...........70  
Table 4.2b  NTQ items included in analysis ...............................................................73  
Table 4.3  Item total statistics: Risk .................................................................75  
Table 4.4  Item total statistics: Resilience ...............................................................75  
Table 4.5  Item total statistics: Oral health ...............................................................75  
Table 4.6  Item Total Statistics: Chronic disease ....................................................76  
Table 5.1a  Chronic disease in study sample .............................................................84  
Table 5.1b  Chronic disease rates versus perception in study sample ..........................85  
Table 5.1c  BMI and weight status ...........................................................................85  
Table 5.1d  Oral health in study sample .................................................................86  
Table 5.2  Correlations: Overall risk and specific items ............................................87  
Table 5.3  Correlations: Age, BMI, Sex, Chronic disease, Oral health, Risk .................89  
Table 5.4  Summary table of interview participant demographics .............................90  
Table 6.0  Positive Deviance and Food Choice Process Model applied to findings .........114  
Table 6.1  Anthropological theories applied to findings ...........................................117
List of Figures

Figure 1.0  Genesis of the Current Dissertation Study ...............................................................3
Figure 1.1  Overweight increases in rural and urban populations from 1990-2010..................48
Figure 2.0  Theory applied to mixed methods study research design ......................................62
Figure 6.0  Spectrum of indigenous nutrition transition ........................................................135
Figure 6.1  Emergent constructs in the proposed preliminary Geo-Nomics Theory and Framework .................................................................148
Figure 6.2  Emergent Geo-Nomics Conceptual Framework applied to ethnographic Findings ....................................................................................................................149
Abstract

The nutrition transition is a global phenomenon in which diets have become increasingly westernized and processed while lifestyles have shifted from labor intensive to sedentary, largely on account of the advent of technology, globalization and urbanization. Despite the prevalence of this phenomenon, very little is known regarding how the nutrition transition has affected the risk of comorbid chronic diseases among indigenous Kichwas communities in Ecuador.

Aims of this study are: 1) Identify specific health outcomes (such as diabetes, hypertension, and high cholesterol) associated with the lifestyle risk factors of the nutrition transition among the Andean Kichwas indigenous population; 2) Explore the sociocultural factors (such as gender roles, culinary traditions, urbanization and globalization) which influence dietary behavior and food choices within Kichwas indigenous households; 3) Assess the construct relevance of the Nutrition Transition Questionnaire (NTQ), a pilot instrument designed to measure key constructs of the nutrition transition within indigenous Kichwas Andean households.

The current study is a convergent parallel mixed methods design that consists of two components: 1) Secondary data analysis of the internal reliability of the Nutrition Transition Questionnaire, a pilot instrument designed to assess obesogenic lifestyles at the individual and household levels; 2) Primary ethnographic qualitative data collection among the Kichwas community residing in the Imbabura province of Ecuador. Thirty-four interviews were conducted with nutritional gatekeepers (i.e. women who make the majority of household dietary decisions) to explore lifestyle trends related to diet and exercise within the Kichwas community. Twenty-five intercept interviews were conducted at various food vending locations throughout the community.
Internal reliability of the NTQ was assessed using Cronbach’s alpha and inter-item correlations while qualitative data were analyzed using applied thematic analysis. Chronic disease occurrence in the sample was also assessed for diabetes, hypertension, high cholesterol and obesity. Results suggest that key constructs in the Nutrition Transition Questionnaire are relevant to assessing lifestyle risk and protection regarding chronic disease. Main qualitative themes include gender roles within food preparation; the impact of collective culture upon food choices and household dietary behavior; and the protection offered by access to home gardens.

The discussion highlights several differences between this study population and other indigenous populations. It also posits that a new emergent theory, Geo-Nomics theory, can provide a useful future tool in framing additional ethnographic nutrition transition research. The conclusion indicates this study’s most useful contributions to the literature, which include the development of a potential thermos intervention to decrease fast food consumption when Kichwas men commute far from home to work.
Chapter 1. Introduction

Introduction to this Dissertation

The nutrition transition refers to the increased risk of chronic illness and obesity as a result of dietary westernization throughout the world. To date, very little is known regarding the nutrition transition among the Kichwas speaking people of Ecuador. This study explored the nutrition transition among the Kichwas-speaking people of the Andes mountains in Ecuador. This introduction; elucidates the dissertation’s study purpose, aims and research questions which will be further elaborated upon in the research design covered in the Methods chapter and features a quick overview of the study’s aims, research questions, study design, and theoretical framework, followed by a section on chapter summaries that provide a segue to the ensuing literature review covered in the background section. The ensuing section outlines the genesis of the current study.

Genesis of the Current Study

In November 2015, focus group data were collected among the Kichwas Andean community in Ecuador for a study that examined the syndemics of HIV, nutrition, substance abuse and domestic violence. Many focus group participants indicated that their foremost concern was nutrition, particularly as it related to the ongoing nutrition transition which appeared to be driven by several co-occurring social phenomena: la desculturización (i.e. loss of indigenous identity), urbanization through employment, and household dietary patterns that have shifted considerably in order to accommodate the departure from traditional gender roles signified by dual income (Chee et al., 2016). These findings indicated the need for further study,
specifically in two ways: 1) The need for a lifestyle assessment tool that measures obesogenic behaviors related to the nutrition transition (obesogenic household and individual dietary practices; urbanization; employment; westernization) and the occurrence of comorbid lifestyle chronic conditions (e.g. diabetes, heart disease, stroke, hypertension); 2) Ethnographic exploration of the socio-cultural factors (such as cultural shifts, changing gender roles, culinary traditions and health beliefs) which contextualize the food choices that people make within the context of the nutrition transition.

In August, 2016, I joined a team from the Pontificia Universidad Católica de Ecuador (PUCE); I participated in their anthropometric study which assessed body mass index (BMI) and a host of other anthropometric measures related to nutritional health status. Disease data from the anthropometric study include diabetes, hypertension, high cholesterol and BMI; this data were then utilized in the current dissertation to assess disease occurrence and comorbidity within the Kichwas study sample. The anthropometric team also administered the Nutrition Transition Questionnaire (NTQ), which was analyzed as secondary data analysis for the quantitative strand of the current mixed methods study. The chronology of previous studies and the consequent research design of this current study is depicted in Figure 1.0.

Quantitative and qualitative data strands were analyzed separately before results were triangulated. Quantitative data were analyzed using SPSS, primarily through Cronbach’s alpha to assess construct reliability and Pearson inter-item correlations to examine conceptual cohesion among items grouped according to risk, resilience (i.e., protective behaviors), chronic disease or oral health outcomes. Qualitative data were entered in Spanish in an excel file, ordered by themes explored and recorded in the interview debriefing template. then analyzed using applied thematic analysis. Within this excel file, quotes that were selected for inclusion in this
manuscript were translated into English by the researcher, first using google translate as a starting point then edited by the researcher using the researcher’s fluency in Spanish and ethnographic experience in Ecuador to capture the essence of the person’s words, rather than a word for word verbatim translation. The chronology of the studies leading to this study, together with the timeline of this study, are illustrated below in Figure 1.0.

Figure 1.0 Genesis of the Current Dissertation Study

**Research Setting**

Otavalo is a busy, bustling town with many shops - a place where Kichwas people go to buy whatever supplies they need. There is also a large tourist area known as Plaza de Ponchos, where vendors daily set up tents to sell handmade alpaca scarves and jackets, art, leather, silver jewelry and other items. The bus stop in Otavalo has a sizeable street food section, where one can buy a selection of grilled meats such as pork and tripe, fresh fruits juices and smoothies, and
an array of what locals call *la comida chatarra*, (or fast food) which mostly consists of various fried meats, hard boiled eggs and rice. La Plaza de Ponchos has a similar array of fast food at night, when street food vendors replace those selling local art and leather. There one can find a large selection of street food and local delights such as corn-based cakes known as quimbolitoes, which are freshly made each day.

By contrast, Cotacachi is a small, hilly countryside town with a food court and a fresh fruit market at its center. While there are several shops there, this town has posters of exotic fruits throughout the streets, designed to encourage a healthy lifestyle. Exotic, colorful fruits and vegetables, most of them picked within days of making it to the vendor, are easily available in Cotacachi’s fresh fruit market, which also boasts an intriguing variety of fragrant and freshly dried, locally cultivated herbs. Intercept interviews were conducted in both these locations, while in-depth interviews were conducted in Cotacachi and towns such as Santa Barbara, Tukuru, and Morochos, the latter of which is at a considerably higher altitude, making access to transportation a challenge. Horticulture and agriculture are also difficult at higher altitudes on account of the cold weather that discourages the growth of citrus and various fruits that thrive with warmer temperatures.

Farming in this community is done primarily by women, although I encountered several couples who both devoted their time to crops and livestock rearing. In these rural, mountainous communities, many families raise some form of livestock – cows, pigs and or chickens, depending on the size of their land. Some worked neighboring cornfields, while others own their own fields that grow various crops – corns, beans and or potatoes. Altitude and climate together serve as ecological factors related to earth-plate proximity: communities such as Turuku and Santa Barbara at 8000 feet above sea level were warm enough to grow a variety of fruits and
vegetables; whereas communities such as Morochos that are closer to 10,000 feet above sea level are too cold to grow citrus, which decreases access to citrus. Transportation also grows increasingly difficult as elevation increases. Paved roads at 8,000 feet become dirt paths at higher elevation. This presents a challenge to fruit trucks that circulate throughout the community in an effort to widen distribution of and access to fresh produce. For example, Towns such as Turuku and Santa Barbara have well paved roads and are accessible to fruit and water trucks that circulate the area whereas towns at high elevation such as Morochos have dirt roads at best and are not easily accessible to vehicular transportation.

In many families, where women do the farming (thereby maintaining the family’s horticultural lifestyle) while their husbands travel to work in the city. The income they earn provides money for the family to buy necessities. Women also sell milk and pigs to increase the family income. Other income opportunities include juicing and smoothie stands that women set up at bus stops, cafeterias, roadsides, and festivals. Other women make baked goods such as quimbolitos, fluffy single serving sponge cakes made with white corn flour and raisins, wrapped in banana leaves and steamed. Farming practices appear to be close to ancestral traditions – women carry heavy loads of dried corn on their backs up steep hills at high elevation, without the aid of wagons. Similarly, agriculture in the fields is largely done without the aid of machinery. The Otavalos have an interesting history. In the 1980’s, the towns or pueblos came together to form a Kichwas Social and Economic Organization, which established a system of leadership in which elders united to make decisions to promote the social and economic welfare of the communities they represented. I discovered this history on account of my stay at a hacienda owned by a former mayor of Cotacachi, who was credited for initiating this organization, a feat
he was able to accomplish largely on account of his exceptional educational status (he completed high school then went on to become a respected teacher).

**Kichwas Indigenous Identity in the Research Setting**

Kichwas indigenous identity is represented in a variety of ways which changes with geographical regions. Among the Otavalo of the Imbabura province, men wear all white – long sleeved shirts and pants, with long braided hair they refer to as Shimba. Among the Otavalo, a man’s shimba, both in terms of its length and neatness, are considered symbolic of his integrity and strength of character. The men additionally wear white hats with a black leather accent. One Kichwas elder shared with me that the traditional Kichwas wear for women can cost as much as $500 USD for a single complete outfit that includes a long traditional skirt, a white hand-embroidered shirt, simple flat closed toe shoes and elaborate gold jewelry that encircles the neck and collar bone with multiple concentric strands. Most speak fluent Spanish, although the older grandparent generation may be less versed in Spanish.

The Otavalo Kichwas are also farmers who raise a variety of livestock (pigs, cows, chickens, alpaca, guinea pig) to supplement both their income and diet. Additionally, shamans of Ibarra in the Imbabura practice a syncretic religion that combines Catholicism with Mama Pacha tradition that incorporates a strong awareness of botanical medicine. Those who believe in the Mama Pacha religion often turn to its botanical and spiritual practices in place of western medicine.

**Positionality**

I stayed for one month at a hacienda in Turuku, an area where many families had gardens, in contrast to other communities where gardens are not as accessible. This hacienda, a two-house property with many rooms, was owned by a former mayor of Cotacachi. The family
who hosted me had three children, two cats and two dogs. My stay with this host family affected my positionality in a fundamental way. The community, naturally wary of outsiders, warmed up to me when they learned that I stayed at this home. My time with my host family also enlightened me regarding the impact of history upon my work as an ethnographer: on account of having suffered two waves of colonization (first from the Incas who largely let them maintain their traditions as traders and weavers, and then from the Spaniards), the Kichwas are naturally inclined to be wary of outsiders and foreigners. This wariness was evident in the eyes of women in particular, who made note of my American clothes, which marked me as a foreigner from a distance. Children were also very shy around me – infants would scan my facial features, note that I am not Kichwas, and avoid eye contact with me thereafter.

This outsider status amplified the value of my connection to the former mayor, whose name served as a powerful passport into the community, building trust and rapport with people who would have been less inclined to trust me had I not been a friend of their esteemed compatriot. My friendship with the former mayor also helped me to access deep insight about the community. In one instance, he connected me to another Kichwas elder, a woman who revealed the history of the community regarding the story of how fruits and vegetables became a way of life, in an effort to ward off child malnutrition due to a lack of citrus consumption. She shared that in the 1980’s the children suffered from malnutrition due to a lack of citrus and fruits in their diet. This widespread problem caused concern among the Kichwas elders and leadership, who held a meeting to resolve this issue. They decided to spread seed throughout their communities, along with recipes that incorporate fruits and vegetables. This intentional act on the part of the Kichwas leadership set the foundation for a traditional lifestyle in which fruits and vegetables are not only a way of life but also integral to the Kichwas indigenous identity. In so doing, the rich
history that led to the fruits and vegetables posters I saw throughout the streets of Cotacacchi became an intangible cultural value that translated itself into the palpable availability of brightly colored produce in the market and various corner stores in the countryside. This history seems to have had less impact in the more metropolitan, bustling town of Otavalo (Otavalo is both a town and a cultural enclave among the Kichwas that refers to the textile experts, weavers, and traders), where fruits and vegetables were not as abundant in corner stores that sold more soda, dried pasta, and even fast foods in some instances.

One way in which this research incorporated ethnography is cultural immersion. During the day I spent my time conducting in-depth interviews during the with community members as part of an interview team with two nurses. Participant observation took place when we did in-depth interviews, as well as on my own in the evenings spent with my host family. Intercept interviews were also conducted with the nurses at bus stops both in the rural countryside of Cotacacchi and the bustling urban streets of Otavalo. In the evenings and on weekends, I spent time getting to know both the grandparents and the parents in my host family, along with their friends and extended family. My bond with the family grew over time and as it did, I was invited to various family outings to the mall, to an outdoor livestock market and to spontaneous drives to run errands with the older generation that included the former mayor, his wife and his elder brother. It was during these unplanned adventures that I did fact-checking by sharing ethnographic vignettes with the family and asking them for their ideas and feedback during informal conversations. My host family thus served as my key informants who participated in an interactive process of informal unstructured interviews so that I could ensure the trustworthiness of my data by running new insights by them as we drove from one place to another. Other key informants included an elderly woman who sat beside me on a bus; she revealed the value of the
soil and its role in the nutrient density of livestock and vegetation. This chance encounter also led me to understand why guinea pigs are considered a delicacy – they consume a rich diet of herbs and thus may act as a source of uncommon vitamins and minerals in which the people may occasionally be deficient. In this way, the role of guinea pigs as a delicacy is somewhat similar to the value of the ahi pepper condiment (made from *tomate de arbol* or tree tomatoes – a fruit that combines the tastes and textures of a mango and a roma tomato; onions, salt and freshly squeezed lemon juice), which similarly boasts a recipe high in vitamins such as vitamin C and prebiotics such as raw red onions. This condiment likely helps to diversify the diet and ensure that family members get the required amount of vitamin C on a daily basis, regardless of climate and the accessibility of fresh citrus and home gardens.

Furthermore, my status and privilege as a researcher from the United States created a distance that I worked hard to de-emphasize through participant observation in cooking and other family events in my host home. While I spoke fluent Spanish, I was clearly not from Ecuador. This status as an outsider to the community made it necessary to conduct in-depth interviews and intercept interviews with the two nurses who administered the structured NTQ interview among the Kichwas. My positionality as an outsider also affected my ability to cook with women in the community as I had planned. The Kichwas of the countryside among whom I lived were very wary of foreigners and showed a clear mistrust of outsiders. This mistrust meant that Kichwas women were not always comfortable with the idea of cooking with the interview team. In order to respect this wariness, I chose to conduct most of my participant observation with my host family and their close neighbors, with whom I had built a stronger relationship and had better rapport. While women in my host family shared with me various details about food and the medicinal uses of food, the men of my host family shared keen insight into the history and
etiology of cultural practices and traditions. In this way, my stay at the former mayor’s hacienda, and my bond with his daughter-in-law who was my host mother, was a pivotal and crucial source of insider information into the culture, history and dietary practices of the community. When neighbors learned who I was staying with (my host mother), they became much more willing to let me cook with them and conduct semi-structured interviews with them.

**Research Rationale and Significance**

Thus far, there are no psychometric tools available to explore the nuances of nutrition transition as it occurs in communities. It should be noted that, currently, only one study has examined the individual dietary behaviors associated with the NT (Imamura et al., 2015), while few if any studies have measured lifestyle (physical activity, urbanization, globalization) and diet. This therefore constitutes a considerable gap in the literature, given the range of variability regarding how this phenomenon may unfold in the daily lives of people concurrently affected by the epidemiological shift (Omran, 1971), market penetration of western businesses due to market integration, urbanization, globalization. Together, these co-occurring phenomena facilitate the NT and its consequent endemic risks of chronic disease for populations such as the indigenous Kichwas speaking people of the Andes, whose lifestyles have shifted from traditional ways to modern ones due to urbanization and globalization.

This research therefore has considerable practical importance, on account of its potential to contribute meaningful information to health authorities who wish to create evidence-based health interventions to promote healthier lifestyles and lower the risk, incidence and occurrence of chronic disease and metabolic syndrome amongst Andean indigenous people. Furthermore, few if any mixed methods studies have been attempted to understand the syndemic nature of the key co-occurring phenomena that drive the nutrition transition. These syndemic drivers include:
dietary patterns, physical activity, urbanization and globalization. These shall be referred to as the key constructs of the nutrition transition. Secondly, qualitative data of the current study can provide insight regarding lived experiences related to the NT. Thirdly, it expands the field by contributing a pilot instrument that can be used to assess individual lifestyles within communities undergoing this epidemiological shift (Omran, 1971). Thus, the research rationale also signifies the practical value of this study.

Additionally, this work can offer rich data by exploring a variety of diverse perspectives related to the nutrition transition on account of the mixed methodology current. This study can therefore enrich and strengthen the evidence base upon which health interventions, health education and a variety of health promotion initiatives should be based (Eldredge, Markham, Kok, Ruiter, & Parcel, 2016; Sullivan-Bolyai, Bova, & Harper, 2005) to provide impactful and culturally relevant, sensitive resources and knowledge that are necessary to evoke sustainable and positive health behavior change among the indigenous Andean people of Ecuador.

**Study aims.** The current study aimed to: 1) Assess the occurrence of chronic diseases (such as diabetes, hypertension, and high cholesterol) associated with the lifestyle risk factors of the nutrition transition among the Kichwas indigenous study sample; 2) Explore relevant sociocultural factors (such as gender roles, culinary traditions, urbanization and globalization) related to lifestyle patterns within Kichwas indigenous households; 3) Assess the content validity of the Nutrition Transition Questionnaire (NTQ), a pilot instrument designed to measure key constructs of the nutrition transition within indigenous Kichwas Andean households. Specific research questions under each of these aims shall be elucidated in the methods chapter.
Definition of Terms

This dissertation utilizes several terms taken from the public health and anthropology literature. For this reason, this section outlines the definitions of specific terms that shall be used throughout this work.

The **nutrition transition** refers to the increased global prevalence and comorbidity of chronic disease on account of dietary westernization, sedentary lifestyles, urbanization, access to and utilization of technology, and the influence of western media through globalization (Popkin, 2012).

**Nutritional gatekeepers** are defined as those in charge of household meal preparation and oversee the majority of household level dietary decision-making – they decide what to purchase, where to purchase it and the concordant menus that result (Wansink, 2003, 2005, 2006). Experts who study nutrition indicate that these gatekeepers influence household dietary behavior including the development of food preferences over time (Birch, Zimmerman, & Hind, 1980).

**Risk** refers to behaviors and or beliefs that increase susceptibility to lifestyle diseases.

**Obesogenic** refers to environmental factors, individual behaviors and beliefs which increase the risk of obesity.

**Metabolic syndrome** refers to a cluster of co-occurring chronic/lifestyle health conditions (blood pressure, high blood sugar, excess body fat around the waist, and abnormal cholesterol or triglyceride levels) that together increase one’s risk for heart disease, stroke and diabetes.
Content validity refers to whether a specific item reasonably reflects the construct of interest, i.e. the degree to which the content of a test representatively samples a domain (Eignor, 2013).

Inter-item reliability refers to the extent to which item responses follow consistent patterns (Eignor, 2013).

Construct relevance in this study refers to whether an item is relevant to the construct of interest – this term is different from content validity in that it refers to the use of data to determine whether an item is actually relevant to measuring a specific construct, whereas content validity refers to whether an item reasonably reflects a construct, based on a combination of expert consultation through the Delphi technique and a review of the literature.

Resilience refers to protective beliefs and or behaviors which can increase individual or household resilience regarding chronic disease susceptibility. In essence, resilience is used to refer to any factor that lowers risk or the actual lived experience of a lower prevalence of or vulnerability to chronic disease.

Syndemics refers to the intersection of risk between diseases, with a specific interest in comorbidities and co-occurring social factors that contribute to disease susceptibility. Ethnography refers to qualitative community engaged methodologies that include in-depth interviews, intercept interviews (brief, informal conversations with community members about specific topics).

Intersubjectivity refers to a shared view of reality among several people, i.e. a shared subjective experience. This term encompasses common perceptions within a community of a specific idea or behavior, such as fast food comprising a risky dietary behavior among this Kichwas population.
La desculturización refers to the loss of cultural identity, in this case among the Kichwas indigenous people of Ecuador. This term implies a loss of cultural and dietary traditions, which in turn is related to the nutrition transition among this population.

Food accessibility encompasses access to fresh fruits and vegetables, primarily through home gardens among the study sample. Food availability refers to foods that are available in one’s home at a given moment in time. This was commonly described as “lo que hay” – which literally means “what there is”. Food quality refers to whether foods are organic or not, as well as whether they are grown from genetically modified seeds. There was a strong awareness of the harmful impact of pesticides and genetically modified food among the study sample. La comida chatarra refers to fast food in Ecuador.

Geo-nomics. Geo-nomics is an emergent theory that resulted from this study. It incorporates synergistic influences that lead to behavioral patterns and eventually lead to health outcomes. While the health outcome of interest in this study is lifestyles (diet and physical activity), the theory can be applied to explore the beliefs and behaviors that culminate in other health outcomes of interest. Geology (location, altitude, slope, seasons, sunshine, rain, temperatures, and other factors which influence agricultural practices) + Ecology (climate, soil, fertility, plant symbiosis, pests, predators and rodents) + Economics (urbanization, globalization, westernization, access and utilization of technology, transportation, employment patterns, migration and immigration).
Organization of this Dissertation

An overview of this dissertation is as follows. The background section delves into the literature regarding the nutrition transition, the current nutritional situation in Ecuador, and the public health significance of the nutrition transition in Latin America, particularly in the context of Ecuador’s burden of disease. The methods chapter purveys details regarding the current study’s convergent parallel design, including recruitment, sampling and data analysis plans for both quantitative and qualitative data. Quantitative data encompasses secondary data from a pilot lifestyle assessment instrument, the Nutrition Transition Questionnaire, gathered by a previous anthropometric study in Ecuador, while qualitative data consists of primary data collected via in-depth interviews, intercept interviews, and participant observation in the Kichwas community. Quantitative results indicate that the key constructs of the Nutrition Transition Questionnaire appear to culturally relevant to assessment of lifestyle risk and resilience regarding chronic disease. High cholesterol, hypertension and overweight/obesity are the most pressing health concerns. Qualitative results elucidate several nuances of lifestyle trends, which include the role of women as the fulcrum of horticulture and family food choices; men’s role as women’s helpers regarding food planning; the protection offered by an agricultural lifestyle, particularly for those who have access to home gardens; the relationship between safety and child physical activity with pets; and the impact of collective culture upon household behavior.

The subsequent discussion chapter compares current findings to the literature, noting several differences between the Kichwas of this study and other indigenous populations throughout the world. Triangulation of qualitative and quantitative data suggests that, regarding the nutrition transition and associated chronic illnesses, several risk and protective factors are related to health outcomes, a finding which warrants further investigation. These findings,
presented in both the results and discussion, present the basis for an argument that advocates the utility of a new, emergent theory, (coined by the term Geo-Nomics theory). This emergent theory addresses the gaps of syndemic theory, positive deviance and the food choice process model, which influenced the conceptualization of this study. The conclusion considers public health practice, research and policy implications of these findings, contributions of this work to the literature, along with potential future research directions.
Chapter 2: Background and Literature Review

Introduction

This background section covers the following topic areas: Kichwas Origins, History and Culture; The Current State of The Global Nutrition Transition; Ecuador’s Current Nutritional Situation; Ecuador’s Economy; Economic development and the nutrition situation in Ecuador; Factors that affect Food Choices, which encompass public health, anthropological and nutrition perspectives on food choices; Dietary Patterns, the Nutrition Transition and Economic Development; Antecedents of the Nutrition Transition among the Indigenous Population; Nutrition Transition Impact on Health in General; Public health significance of the nutrition transition (NT) in general; Historical Milestones; Global and Regional Priorities and Milestones; Public health significance of the nutrition transition in Andean Latin America; Ecuador’s Burden of Disease.

Kichwas Origins, History and Culture

Today there are several million Kichwas residing in various parts of Ecuador. In order to understand the Kichwas (also known as Quechua) as a people, it is necessary to foray into their history and origins. An historical foray into their origins necessitates mention of the Inca empire, which was referred to as Tahuantinsuyu in Kichwas, which translates to “Realm of the four parts” (Britannica, 2018). By the 1500’s, Incan strongholds located throughout Ecuador, Peru, Bolivia, Chile and Argentina were united into one empire which the Kichwas referred to as Tahuantinsuyu (Britannica, 2018). In Ecuador, the Kichwas people refer to an indigenous
population that comprises several smaller tribes (Chibuleos, Karankis, Kayambis, Kisapinchas, Kitus, Otavalos, Panzaleos, Pastos, Puruhaes, Quisapinchas, Salasacas, Saraguros, and Tomabelas) that are scattered throughout the Andes and the Amazon (Becker, 2013). While the origins of the Kichwas language remain a matter of contention, historians generally agree that it likely co-existed alongside Inca culture as a trade language that continues to this day (Becker, 2013).

Historians also distinguish between the highland Kichwas of the Andes and the lowland Kichwas of the Amazon on account of the differences in their experiences with colonization. Historians (Becker, 2013) also agree that these differences become more pronounced in the context of a history that includes not one but two waves of colonization, first with the Incas who interacted more with the highland Kichwas than the lowland Amazon tribes, and secondly with the Spanish conquistadores. While the lowland Amazonian Kichwas remained somewhat insulated from the impact of Inca and Spanish conquest, their Andean counterparts experienced social and economic subjugation through the spread of haciendas, in which they worked as campesinos (i.e. peasants) for the colonists. Consequently, while Amazonian Kichwas have been able to maintain a strong indigenous identity (Becker, 2013), those in the Andes faced the effects of market integration, globalization and westernization through increased access to technology and exposure to western media. An example of this economic, political and historical divide is that of the Otavalos, a Kichwas group in the Imbabura province who identify as weavers and textile specialists. It was among this group of Otavalos in Imbabura that the study took place.
The Current State of the Global Nutrition Transition

Population dietary patterns have been described by five stages: food gathering, famine, receding famine, degenerative diseases, and behavioral change toward a healthy, balanced diet. Researchers note that the majority of the global population is engaged either in pattern three (receding famine) or pattern four (degenerative diseases) (Ervin, López-Carr, & López-Carr, 2013). Most populations are either exiting a state of undernutrition (due calorie / nutrient deprivation), or they have progressed to grappling with the modern version of malnutrition - an overconsumption of high fat density, nutrient poor calories from unhealthy sources. This pattern is high in oils, sugars, animal products, fat, fried foods, cholesterol, sweeteners, processed and prepared foods which are in turn high in preservatives and assorted chemicals (Ervin et al., 2013).

Popkin recently defined the current nutrition transition in terms of three major points: 1) The prevalence of overweight and obesity across most low and middle-income countries (LMIC’s) the prevalence of overweight and obesity is slowly rising to match that of higher income countries; 2) The shifting body mass index (BMI) is progressing to the right (i.e. to heavier individuals); 3) Waist circumferences in selected LMICs of 2–4 cm signify an increase in BMI trends worldwide, over an 18-year period (Popkin, Monteiro, & Swinburn, 2013).

Additional contributors to the nutrition transition include resistance from Big Food industry giants, which presents a considerable barrier to obesity and NCD prevention (Popkin et al., 2013). What is even more concerning is that it remains difficult to track the ingredients of processed goods, in light of the continuous reformulation of packaged foods (Popkin et al., 2013).
In the first analysis of its kind, scholars recently examined individual dietary patterns and healthful eating behaviors in 187 countries (Imamura et al., 2015). This global analysis illustrates that there is considerable dietary heterogeneity throughout countries. Their data suggests that Andean Latin America (Peru, Ecuador, Bolivia) are in the mid-range of healthy eating behaviors, with Ecuador being the least healthy regarding dietary patterns among these three countries.

**Ecuador’s Current Nutritional Situation**

This section addresses the nutritional situation in Ecuador and among indigenous communities living in the Andean region (rates of obesity, under-nutrition, food imports, and food availability). Food availability, it should be noted, is a measure of food security. The Global Food Security Index (GFSI) (EIU, 2016), considers the core issues of food affordability, availability, quality and safety across 113 countries. Food affordability refers to consumers’ ability to buy food, their vulnerability to price shocks and the presence of programs and policies to support customers when shocks occur. Food availability assesses the sufficiency of the national food supply, the risk of supply disruption, national capacity to disseminate food and research efforts to expand agricultural output. Food quality & safety incorporates the variety and nutritional quality of average diets, in addition to the safety of food. Countries each received a rank out of 113 and/or a score out of 100 on each indicator. The index is a dynamic quantitative benchmarking model, derived from 28 indicators that assess drivers of food security across both developing and developed countries. This index is unique in that it does not focus solely on hunger and deprivation; instead it assesses country level food security trends in terms of three comprehensive and internationally established content areas: availability, affordability and quality/safety. Ecuador was named as one of the most notably improved Global Food Security Index (GFSI) country scores, with an improvement of 2.4 points between 2015 and 2016 scores.
Its current 2016 score is 57.5, with a country ranking of 56 among 113 countries; this indicates that food is generally available and accessible. Ecuador’s nutritional situation is assessed below in Table 1.1a with statistics that cover the following topic areas: General Statistics; Nutrition Transition indicators covering obesity and overweight; Physical Activity; Food Imports; Food Security; Food Quality and Safety; Undernutrition and Food Consumption.

Table 1.1a Ecuador Population Statistics: Health; Economy; Nutrition

<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>2016 Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENERAL STATISTICS (EIU, 2016; Master, 2016; Mundi, 2016; WHO, 2016)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Development Index</td>
<td></td>
<td>.73/1.0</td>
</tr>
<tr>
<td>Total population (2015)</td>
<td></td>
<td>16,144,000</td>
</tr>
<tr>
<td>% Indigenous population (explorer, 2016)</td>
<td></td>
<td>25</td>
</tr>
<tr>
<td>Gross national income per capita (PPP international $, 2013)</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Gross domestic product (EIU, 2016)</td>
<td></td>
<td>183.9 billion</td>
</tr>
<tr>
<td>Life expectancy at birth m/f (years, 2015)</td>
<td></td>
<td>74/79</td>
</tr>
<tr>
<td>Crude birth rate (per 1000 population), 2013</td>
<td></td>
<td>20.8</td>
</tr>
<tr>
<td>Crude death rate (per 1000 population), 2013</td>
<td></td>
<td>5.3</td>
</tr>
<tr>
<td>Probability of dying between 15 and 60 years m/f (per 1 000 population, 2013).</td>
<td></td>
<td>157/85</td>
</tr>
<tr>
<td>Total expenditure on health per capita (Intl $, 2014)</td>
<td></td>
<td>1,040</td>
</tr>
<tr>
<td>Total expenditure on health as % of GDP (2014)</td>
<td></td>
<td>9.2</td>
</tr>
<tr>
<td><strong>NUTRITION TRANSITION INDICATORS (WHO, 2016)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obesity BMI&gt;=30 age standardized estimates both sexes 2014</td>
<td></td>
<td>18.7</td>
</tr>
<tr>
<td>Obesity BMI&gt;=30 age standardized estimates female 2014</td>
<td></td>
<td>22.9</td>
</tr>
<tr>
<td>Obesity BMI&gt;=30 age standardized estimates male 2014</td>
<td></td>
<td>14.4</td>
</tr>
<tr>
<td>Overweight BMI&gt;=25 age standardized estimates both sexes 2014</td>
<td></td>
<td>54.1</td>
</tr>
<tr>
<td>Overweight BMI&gt;=25 age standardized estimates female 2014</td>
<td></td>
<td>56.7</td>
</tr>
<tr>
<td>Overweight BMI&gt;=25 age standardized estimates male 2014</td>
<td></td>
<td>51.5</td>
</tr>
<tr>
<td>Probability (%) of dying between ages 30 -70 from cardiovascular causes 2012</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td><strong>PHYSICAL ACTIVITY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity: Insufficiently active</td>
<td></td>
<td>25.2</td>
</tr>
<tr>
<td>Physical activity: Insufficiently active, Female 2010</td>
<td></td>
<td>30.8</td>
</tr>
<tr>
<td>Physical activity: Insufficiently active, Male 2010</td>
<td></td>
<td>19.6</td>
</tr>
<tr>
<td>Child obesity: Children &lt;5 years overweight (%), 2012-2013</td>
<td></td>
<td>7.5</td>
</tr>
<tr>
<td>Child obesity: Children &lt;5 years overweight (%), Female 2012- 2013</td>
<td></td>
<td>7.0</td>
</tr>
<tr>
<td>Child obesity: Children &lt;5 years overweight (%), Male 2012-2013</td>
<td></td>
<td>7.9</td>
</tr>
</tbody>
</table>
Table 1.1a continued

<table>
<thead>
<tr>
<th>Metric</th>
<th>Year</th>
<th>Score/100</th>
<th>Rank/113 countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Total Cholesterol 25+ years Female</td>
<td>2009</td>
<td>4.8</td>
<td></td>
</tr>
<tr>
<td>Mean Total Cholesterol 25+ years Male</td>
<td>2009</td>
<td>4.7</td>
<td></td>
</tr>
</tbody>
</table>

**FOOD IMPORTS**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Year</th>
<th>Score/100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food imports % of merchandise imports 2014 (index mundi)</td>
<td></td>
<td>7.75</td>
</tr>
<tr>
<td>World ranking in food imports % of merchandise imports 2014 (index mundi)</td>
<td></td>
<td>163</td>
</tr>
</tbody>
</table>

**FOOD SECURITY: GLOBAL FOOD SECURITY INDEX (GFSI) DATA (EIU, 2016)**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Year</th>
<th>Score/100</th>
<th>Rank/113 countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 Overall GFSI Score/100; Rank/113 countries</td>
<td></td>
<td>57.5; 56</td>
<td></td>
</tr>
<tr>
<td>FOOD AFFORDABILITY 2016 Score/100; Rank/113 countries</td>
<td></td>
<td>58.5; 54</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.1a continued

<table>
<thead>
<tr>
<th>Metric</th>
<th>Year</th>
<th>Score/100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food consumption (% of total household expenditure)</td>
<td></td>
<td>74.3</td>
</tr>
<tr>
<td>Presence of food safety net programs</td>
<td></td>
<td>GFSI score 50/100</td>
</tr>
<tr>
<td>Access to financing for farmers</td>
<td></td>
<td>GFSI score 75/100</td>
</tr>
<tr>
<td>FOOD AVAILABILITY 2016 Score/100; Rank/113 countries</td>
<td></td>
<td>56.9; 59</td>
</tr>
<tr>
<td>Sufficiency of supply</td>
<td></td>
<td>GFSI score 54.3/100</td>
</tr>
<tr>
<td>Average food supply</td>
<td></td>
<td>kcal/capita/day 37.7</td>
</tr>
<tr>
<td>Dependency on chronic food aid</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Public expenditure on agricultural Research &amp; Development (Rating 1-9)</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Agricultural infrastructure</td>
<td></td>
<td>GFSI score 51.9/100</td>
</tr>
<tr>
<td>Existence of adequate crop storage facilities</td>
<td></td>
<td>GFSI score 100/100</td>
</tr>
<tr>
<td>Volatility of agricultural production (standard deviations)</td>
<td></td>
<td>GFSI score 93/100</td>
</tr>
<tr>
<td>Urban absorption capacity [GDP (% of real change) minus urban growth rate]</td>
<td></td>
<td>67.5</td>
</tr>
<tr>
<td>Food loss (Total waste/total domestic supply quantity (tonnes))</td>
<td></td>
<td>GFSI score 90.8/100</td>
</tr>
</tbody>
</table>

**FOOD QUALITY AND SAFETY**

<table>
<thead>
<tr>
<th>Metric</th>
<th>Year</th>
<th>Score/100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food safety</td>
<td></td>
<td>GFSI score 89/100</td>
</tr>
<tr>
<td>Proportion of population under poverty line %</td>
<td></td>
<td>87.5</td>
</tr>
<tr>
<td>Diet diversification %</td>
<td></td>
<td>82.1</td>
</tr>
<tr>
<td>Nutritional standards</td>
<td></td>
<td>GFSI score 65.4/100</td>
</tr>
</tbody>
</table>
### Table 1.1a (continued)

<table>
<thead>
<tr>
<th>National nutrition plan or strategy</th>
<th>GFSI score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition monitoring and surveillance</td>
<td>100/100</td>
</tr>
<tr>
<td>Micronutrient availability</td>
<td>25.3/100</td>
</tr>
<tr>
<td>Dietary availability of vitamin A</td>
<td>50/100</td>
</tr>
<tr>
<td>Dietary availability of animal iron</td>
<td>25.9</td>
</tr>
<tr>
<td>Presence of formal grocery sector</td>
<td>100/100</td>
</tr>
</tbody>
</table>

**UNDERNUTRITION**

- Children <5 years underweight (%), Both sexes 2012-2013 (WHO, 2016)…… 6.4
- Children <5 years underweight (%), Female 2012-2013(WHO, 2016)……… 5.6
- Children <5 years underweight (%), Male 2012-2013(WHO, 2016)……… 7.1
- Prevalence of undernourishment (GFSI data) (EIU, 2016)………………… 10.9%

- Intensity of food deprivation (GFSI data) (EIU, 2016)……………….. 70 kcal/person/day

**FOOD CONSUMPTION (FAO, 2016a) (2005-2008 data)**

- Dietary Energy Consumption (kcal/person/day) Latin America .............. 2940
- Dietary Energy Consumption (kcal/person/day) Caribbean.................. 2590
- Ecuador Average daily dietary energy consumption per capita(kcal/person/day) 2300
- Ecuador Dietary Protein Consumption (g/person/day) ..................... 57 (.057 kcal)
- Ecuador Dietary Fat Consumption (g/person/day).......................... 89 (.089 kcal)

**Ecuador’s Economy**

Ecuador is the 69th largest export economy in the world and the 107th most complex economy according to the Economic Complexity Index (ECI) (Economics, 2016). In 2014, Ecuador exported $27.4B and imported $27.4B, resulting in a positive trade balance of $23.8M. In 2014 the GDP of Ecuador was $100B and its GDP per capita was $11.4k (media, 2016). Its
employment rate is 93.32%, as of June 2016 (Economics, 2016). The country’s labor force consists of roughly 4.682 million in urban areas (explorer, 2016). Population distribution by occupation reveals clear movements towards urbanization and globalization, with services and other activities representing 53.6% of the labor force; industry representing 18.8%; and agriculture representing 27.6% (explorer, 2016). The size of the service sector suggests clear market integration as a result of urbanization and globalization – this in turn signifies that processed goods circulate throughout Ecuador as a result of food import distribution. Additionally, the value for food imports (% of merchandise imports) in Ecuador was 7.75% as of 2014 (Mundi, 2016).

**Economic Development and the Nutritional Situation in Ecuador**

Cardiovascular disease, obesity, hypertension and high cholesterol, while once considered diseases of affluence, are now affecting more countries on account of the rise in economic development (Ezzati et al., 2005), such as is the case with Ecuador’s fast-growing, oil and gold based economy. Ecuador has a strong economy which means that individuals, especially urban ones, have strong purchasing power, which facilitates a wider range of dietary options: food prepared outside of the home at restaurants, fast foods available at American chain restaurants, fried street foods, processed imported pre-packaged meals at groceries, imported artificial juices as well as sodas. As indicated by the food availability GFSI data, food security is relatively high – food is available, affordable and of reasonably high quality. Given that the government expenditure on agricultural research and development is rated at zero (EIU, 2016), local agriculture is not an economic priority (Mundi, 2016). This means that the population, with an increasing level of disposable income, is susceptible to the cultural shift away from nutritious locally grown traditional foods to popular western foods featured widely in television
advertisements and media on the internet, to which a large proportion of the population has access through television ownership (88.8% of households own a television (Master, 2016)) and access to the internet (38.86 per 1000 people (Master, 2016)).

Undernutrition and stunting rates are relatively low, affecting less than 11% of the population, at a deprivation rate of roughly 70 kilocalories per person daily while daily dietary energy availability per capita is estimated at 2000-2200 kcal (FAO, 2016b) Average daily dietary energy consumption per capita (2006-2008) in Ecuador is estimated at 2300 kcal (FAO, 2016a). Fat consumption at 89g/day is higher than protein consumption at 57g/day. These numbers suggest high rates of daily overeating in Ecuador. Overweight and obesity rates reflect this assessment, with overweight affecting just over half (54%) of the population and obesity impacting just under one fifth of the country (18.7%). It should be noted that since overweight numbers are much higher than obesity rates, it is likely that the chronic disease crisis endemic to countries affected by the NT has not yet reached its maximally critical level in Ecuador.

**Urbanization, Globalization, Economic Development and the Nutrition Transition**

Urbanization and globalization have also played very influential roles in spreading the nutrition transition. Broadly defined, urbanization may be considered an influx of people moving to cities in pursuit of work (Popkin, 1998). Globalization proxy measures include access to technology and the internet, as quoted in the statistics above. With an urban absorption rate of 67.5% (EIU, 2016), it is clear that over half of the population is undergoing this shift. Among indigenous communities, there has also been an influx of people who commute to the city to work while maintaining a rural residence far away. This is occurring among indigenous communities in Ecuador, based on focus group data collected there in November 2015. This data also suggests that Ecuador is undergoing the nutrition transition. This section examines the
convergence of urbanization, globalization and economic development and their syndemic, synergistic influence as population level drivers of the NT.

As suggested by interviews with Latino immigrants conducted by Himmelgreen et al, urbanization and migration bear striking similarities regarding their effects upon household dietary behavior; both signify a dramatic shift in daily schedules from traditional lifestyles that result in unhealthy dietary habits (Himmelgreen, Romero Daza, Cooper, & Martinez, 2007). Among indigenous Andean populations, in dual income households (where parents commute to and work long hours in the city due to urbanization), women have less time to devote to child care, cooking and meal preparation. The glaring consequence of such new time restrictions is a consequent shift in family diet and food preferences among both indigenous households and Latino immigrants. The complex dietary circumstances identified by Latino immigrants (Himmelgreen et al., 2007), bears striking similarity to the difficulties reported by focus group participants in the HIV study that led to this proposal, with the main exception of legal difficulties. Both groups struggle with time constraints, reduced family interaction, increase in purchasing power and concerns over loss of control of child health. Thus, the nutrition transition is closing the gap between formerly disparate groups who now suffer similar health concerns.

Factors that affect Food Choices

Food choice is a complex and multifaceted process that occurs in response to many diverse influences (Sobal, Bisogni, & Jastran, 2014). This section covers the factors that affect food choice from the perspective of three fields: public health, anthropology and nutrition. Public health factors named in this section are largely at the community level, nutrition factors focus on individual factors, while anthropology highlights macrocosmic factors such as culture and global food politics. It should be noted that, given the paucity of research specifically focused on
indigenous communities, the factors discussed in this section are taken from the general literature but applied in this discussion to indigenous Andean communities.

Public Health Perspectives on the Process of Food Choice

The food choice process model (FCPM) (Sobal, Bisogni, Devine, & Jastran, 2006), discussed in detail in the theory paper, presents an excellent overview of the plethora of factors that affect food choice among indigenous communities. This section therefore elaborates on these factors by identifying a few influences upon food choice that are of concern to public health professionals who wish to work with indigenous Andean populations.

Factors that affect food choice in the Andean indigenous communities include: environment and agriculture (Johnston, Fanzo, & Cogill, 2014a); life history (Laran & Salerno, 2013); Mobility and access to food (Coveney & O’Dwyer, 2009); ambience (Stroebele & De Castro, 2004); personality (Keller & Siegrist, 2015); sensory, physiological, and psychological factors (Gibson, 2006); occupation – scholars indicate that the timing of work/shifts affects the timing of meals; income (Devine et al., 2006). Family in particular plays a particularly influential role upon dietary behavior (Gillespie & Johnson-Askew, 2009; Hardcastle & Blake, 2016; Lachat et al., 2012; Renner, Sproesser, Strohbach, & Schupp, 2012; Rothman, Gillespie, & Johnson-Askew, 2009).

Anthropological Perspectives on the Process of Food Choice

This section covers cultural influences upon food choice posited by the field of anthropology. These factors include food signification, tastes of luxury versus necessity, and the McDonaldification of society. It is also possible that the nutrition transition is quickly closing the lifestyle gap between migrants in the US and traditional households in the Andes that are undergoing the nutrition transition.
**Food signification.** Roland Barthes (Barthes, 1997) uses the example of bread, indicating that some forms are more meaningful or significant than others, depending partly upon one’s taste. In so doing there exists a “veritable grammar of foods”. Barthes expands this idea by stating that few if any natural foods initially signify anything on their own, with the exception of bourgeoisie foods such as salmon, caviar and truffles, for which preparation is valued far less than their absolute cost. This scholar explains that context shapes the signification assigned to foods and that this may vary by socioeconomic status. Bourdieu (Bourdieu, 1984a) adds that working class meals may differ from bourgeoisie meals in both form and substance, with working class meals offering more abundance in the form of “elastic” dishes such as soups, sauces, pasta or potato included with vegetables – these are served with ladles to avoid portion measurement and to facilitate second servings, a feature that is important when feeding adult men whose plates are often filled twice (Bourdieu, 1984b).

This feature of meals may very likely apply to traditional households in the Andean indigenous people. It should also be noted that the expectation women feel to fill men’s plates twice (Bourdieu, 1984b) represents a powerful yet implicit way in which gender roles may influence dietary choices among indigenous households. It is also reasonable to extrapolate that another signification of food is rooted in its representation of ancestral traditions versus modern ways of life. Focus group data collected during the HIV study revealed that bread, rice and fast food (*la comida chatarra*), in particular, appear to be synonymous with modern lifestyles associated with the NT while corn represents ancestral heritage and traditional Kichwas culture.
**Tastes of luxury versus necessity.** Bourdieu suggests that Barthes’ food system can be understood in a more granular fashion if one takes into account the concept of a food space in which different types of occupations prioritize different aspects of food. The three “styles of distinction” as he describes them are as follows: food, presentation and culture (Bourdieu, 1984a). These ideas are not separate from the effects of gender construction; through the process of food preparation there is a “whole conception of the domestic economy and of the division of labor between the sexes (Bourdieu, 1984a, p.33)” Bourdieu (Bourdieu, 1984a) points out that most women are compelled to cook meals that are quick and save as much time as possible. In the case of Andean Kichwas communities, fast foods and imported processed foods may also be symbolic of the purchasing power and prestige of belonging to a global food culture characterized by the unifying and uniform features of the western diet, all of which pose well-established health risks that have been discussed elsewhere in this paper. Processed foods may very likely be the new taste of luxury, as indicated by one researcher, who indicated that children’s food preferences for western foods are strongly influenced by the globalizing mechanism of western advertisements on television (Albala, Vio, Kain, & Uauy, 2002).

**The McDonaldization of Society.** The McDonald’s fast food chain began its franchise in 1955. Subsequent franchises which followed their lead include Kentucky Fried Chicken (KFC), Burger King, Wendy’s, Subway and Pizza Hut (Atkins & Bowler, 2001). Since 1993, more than 33% of McDonald’s franchising has been international. This is one example of many such international franchising of fast food chains. Scholars have reflected upon the commercial advantages of such McDonaldization: Ritzer (Ritzer, 1996) summarizes these as efficiency, calculability, predictability and control. Fast food is an efficient method of accessing and consuming a meal; customers can calculate how much they can expect to spend in advance; rules
such as uniforms create a predictable experience; product control means that technology replaces human agency. As a metaphor for cultural change, McDonaldization is reflected in the popularity of *la comida chatarra* in the indigenous community.

Additional anthropological literature considers a number of other factors that influence food choice. These factors include: Gender (Wardle et al., 2004); Family culinary tradition (Bowen & Devine, 2011); Culture (Freedman, 2016); Family norms (Olsen & Tuu, 2013); Urbanization (Price & Nguyen, 2016) and Globalization (Swinnen & Maertens, 2007).

Globalization, broadly defined as the spread of western culture through a variety of avenues, has had clear and specific effects upon food choices by popularizing western processed foods through the media. For example, food marketing influences food preferences (Chandon & Wansink, 2012), as do advertisements accessed through cable television and the internet (Lee, Kim, Lee, Yoon, & Chung, 2014). An additional aspect of globalization has been the increased access of developing countries to imported goods, such as that which occurs when “big box” stores set up stores in foreign soil (Taillie, Ng, & Popkin, 2016). This westernization of the global food system (Swinnen & Maertens, 2007) has been referred to as the “supermarket revolution” (Reardon & Hopkins, 2006). This transformation of the global food system has serious implications for countries such as Ecuador that are undergoing the nutrition transition. Ease of access to processed foods signifies dietary patterns that increase the risk of chronic disease among indigenous Andean communities (Swinnen & Maertens, 2007).
Nutrition Perspectives on the Process of Food Choice

This section examines several of the factors that affect food choice, as identified by scholars in nutrition literature. Many of these factors are related to specific dietary behaviors and food system factors that may impact access to healthy food. A recent systematic review in the nutrition literature that examined the most frequently cited factors that affect adult dietary behavior identified largely social and cultural correlates (Sleddens et al., 2015) that influence food choices. Additional factors identified by this review were sedentary behavior, habit strength, motivational regulation, and shift work (Sleddens et al., 2015).

As reflected by indicators gathered in the GFSI data, food system factors affect food choices. These food system factors include Food security (Porter et al., 2014); Food availability (Bryant & Stevens, 2006); Food affordability (Darmon & Drewnowski, 2015; Gyles et al., 2012); Food taxes (Thow, Downs, & Jan, 2014); Diet diversity and flexibility (Turner & Thompson, 2013); Fast food attractiveness and availability (Bezerra, Curioni, & Sichieri, 2012).

Individual factors that affect dietary decision-making include: Gender, age, level of education, and personal health status (Ozen, Pons, & Tur, 2012); stress (Barrington, Beresford, McGregor, & White, 2014; Roberts, Campbell, & Troop, 2014); hormones (Loper, La Sala, Dotson, & Steinle, 2015); pleasure (Jacquier, Bonthoux, Baciu, & Ruffieux, 2012); and reward (Alonso-Alonso et al., 2015). Individual dietary behaviors that affect food choices include: food parenting practices (Vaughn et al., 2016); meal frequency and snacking behaviors (La Fleur, Luijendijk, Van Der Zwaal, Brans, & Adan, 2014); meal frequency in general (Leech, Livingstone, Worsley, Timperio, & McNaughton, 2016); beverage consumption (Fardet & Boirie, 2014); Bread consumption (Bautista-Castaño & Serra-Majem, 2012); and breakfast consumption (Allirot et al., 2014). Scholars also note that meal frequency influences caloric
intake (Evans, Jacques, Dallal, Sacheck, & Must, 2015). Additionally, television viewing is particularly influential among children, who are likely to consume more calories (that often include soda and snacks) when they watch television (Matheson, Killen, Wang, Varady, & Robinson, 2004).

The most extensive anthropological and nutritional study that focused upon indigenous populations was conducted by Price and Nguyen, who did research comparing the dental and nutritional status among urban and rural indigenous populations throughout the world (Price & Nguyen, 2016). While Price was focused on understanding antecedents and nutritional determinants that effected dental decay, cavities, crowded teeth and weaknesses in facial bone structure, his study simultaneously captures two major antecedents of the NT: westernization of diet and the consequent dietary changes that accompany westernization. Price’s work among the indigenous Andean population revealed several key insights: 1) Proximity to towns affected dietary patterns – the closer a village was to town, the more likely they were to develop oral health problems; 2) Traditional diets, when strictly adhered to with minimal junk food intake, generally signified ideal oral health; 3) Over time, the effect of the urban diet affected not only oral health but also adversely affected bone structure, leading to a pinched nose, crowded jaws, and misaligned teeth. Price’s study gives strong credence to the assertions of biocultural anthropologists, who believe that biology and culture interact to impact physiological evolution and dietary shifts over time (Laland, Odling-Smee, & Myles, 2010).
Factors Affecting Food Choices among Indigenous Groups

Landscape and geographic ecology affect the food system which shapes the traditional diet of indigenous peoples. Among indigenous scholars, these determinants of food choices have been referred to as indigenous food and agro-ecological systems (Woodley, Crowley, de Pryck, & Carmen, 2006). The diverse territory of the Nuxalk of British Columbia clearly illustrates this idea. Nuxalk territory spans a diverse landscape that includes deep bays, valleys, mountains, rivers, streams, marshes, slopes and thick forest vegetation (Turner, Harvey, Burgess, & Kuhnlein, 2009). The Nuxalk’s access to such incredible biodiversity is thereby reflected in their diet, which boasts sea mammals, salmon, shellfish, smelt, steelhead, ooligan, ducks, geese, mule and black-tailed deer, bear, goats, root vegetables, berries (Turner et al., 2009). The Nuxalk maintained a culture of hunting and gathering in which they showed respect for the land through careful use of its resources and smoking, canning, salting, making jams, and fermenting foods to preserve them (Turner et al., 2009). For hunter gatherer societies such as the Nuxalk, environmental deterioration and commercial fish harvesting have detrimentally affected the quality of their traditional diet (Turner et al., 2009). Similarly, among the Gwich’in of Canada, additional environmental concerns include pollution, natural gas pipelines and drilling, which affect the territory of the porcupine caribou, their traditional dietary protein staple (Kuhnlein, McDonald, Spigelski, Vittrekwa, & Erasmus, 2009). Like their counterparts in British Columbia, plants are used for both food and medicine, while they show respect for the land and its animals through thorough use of animals and all edible parts (Kuhnlein, McDonald, et al., 2009).

Market integration, which may also be referred to as market economy penetration (Kuhnlein, Erasmus, & Spigelski, 2009), is the concept whereby indigenous economies grow increasingly exposed to western market systems. Researchers also define it as production that is
geared towards consumption within a market-based economy (Gildner et al., 2016) while others refer to market integration as the synergistic socio-cultural shifts that accompany economic development and thereby impact health outcomes, particularly among indigenous subsistence economies that become exposed to western foods through this process (Liebert et al., 2013). In so doing, market integration affects the food system and food choices of indigenous communities. Among Gwich’in children, for example, the clear impact of market integration is evident in the finding that 55% of children’s dietary energy came from western processed foods (fast, sweets and mixed dishes) available for purchase in the market (Kuhnlein, McDonald, et al., 2009). Additionally, among the Amazonian Shuar of Ecuador, those who live closer to a town have higher HDL cholesterol, which in turn is associated with ownership and consumption of western foods (Liebert et al., 2013). Anthropologists who examine market integration also refer to road access as a key economic determinant which distinguishes indigenous communities into those who are more vulnerable to the ramifications of market integration versus those less susceptible on account of their remote location and consequent inaccessibility to market economies due to poor transportation (Liebert et al., 2013). In so doing, road access also serves as an indirect determinant of food choices on account of its impact upon the food system available to indigenous communities.
Dietary Patterns, the Nutrition Transition and Economic Development

Key findings from previous research conducted on diabetic families in Ecuador implicates the role of economic development in driving the nutrition transition (Dirocco & Cuvi, 2014). The following excerpt from this study (p.8, Dirocco & Cuvi,2014) illustrates how the nutrition transition manifested in the case study that this ethnographer conducted in her interviews with three generations of a rural and urban families, both of whom struggled with diabetes:

“As the grandmother from rural Ecuador recalls, “We used to pick, toast and grind coffee beans by hand. Now, everyone I know drinks instant coffee.”… the eldest member of the urban family, at age 91, transitioned from eating mostly baked goods and drinking mostly fresh fruit juice in her youth to consuming a large amount of soda and packaged sweets today; she also used fresh butter before and now relies more heavily on oil and processed margarine. Similarly, she rarely ate out growing up and now eats out at least once a week, frequenting fast food restaurant more often. The eldest member of the rural family, at age 84, reported similar dietary transitions.”

This ethnographer also noted one intriguing indicator of economic development – the presence of domestic workers. The urban family she interviewed had at one time or another employed domestic workers – this translated to greater ease in preparing meals. By contrast, the rural family had worked as servants at one time or another. The difference in socioeconomic status between these groups means that the urban family had greater access to medical care and therefore enjoyed higher health security. Health care was unreliable and not easily accessible for the lower income rural family. The rural family also reported that their doctors gave very little dietary information to help them manage their diabetes aside from sugar and fried food avoidance. Their diet was high in refined carbohydrates, fried meat and fish, with very few high-fiber vegetables (Dirocco & Cuvi, 2014). The youngest generation of the urban family reported
high consumption of processed foods as a consequence of time constraints, a concern shared by Latino immigrants and indigenous households. This researcher also noted that socio-economic status played an influential role in the families’ respective abilities to successfully manage their diabetes. The ethnographer provides key details (p.8, Dirocco & Cuvi, 2014) regarding dietary behaviors that manifest the nutrition transition in the lives of both the rural and urban families:

“The youngest generation of the urban family, two women ages 27 and 31, reported a high consumption of processed foods in their diets due to time constraints. One reports eating breakfast on the go while driving. They admitted to preparing sauces from packets instead of from scratch and freezing whole meals, practices that both women’s mothers would never have condoned for fear of compromising quality. The youngest generation of the rural family, ages 36, 39 and 42, also mentioned dietary changes evidencing the nutrition transition: higher meat consumption, the use of oils, a greater presence of refined carbohydrates and the use of more kitchen appliances than their mother and grandmother. Testimonies of shifting food habits over three different generations provide insights into the various diet-related changes associated with nutrition transitions.”

**Antecedents of the Nutrition Transition among the Indigenous Population**

This section examines several broad determinants of the NT: the epidemiologic and demographic transitions; food system; diet; urbanization and globalization; physical activity and economic development. The epidemiologic and demographic transitions have both been identified as important population antecedents regarding the nutrition transition (Popkin & Gordon-Larsen, 2004). The demographic transition (Omran, 1971) refers to a pattern of high fertility and mortality has shifted to low fertility and mortality. This has led to an increased life expectancy worldwide. Medical technology has also influenced this change. This is reflected in the epidemiological transition (Omran, 1971) in which high rates of infectious disease have been replaced by increasing prevalence of NCD’s. Increased access to technology has enabled many developing countries to shift their focus from agrarian, labor intensive economies to service
based industries that require far less physical activity. The resulting urbanization historically mirrors the industrial revolution. While little has been written on the antecedents of the nutrition transition upon Ecuador, researchers who wrote about this phenomenon in Chile (Albala et al., 2002) identified several mechanisms that drive the nutrition transition in Chile: urbanization and a consequent increase in lifestyle risk factors; a decline in fertility and lower mortality rates; modernization and its consequent economic growth. Given their proximity, it is reasonable to deduce that this also applies to Ecuador.

The global food system, dominated by giants such as Monsanto, GE foods and CocaCola, plays an influential role in the distribution of processed foods and high caloric beverages to developing countries. Several changes should be noted regarding global access to the processed foods that propel the nutrition transition throughout the world: Increased availability of cheap artificial ingredients due to technological advancements in food processing (Popkin & Gordon-Larsen, 2004); and increased availability (Popkin & Gordon-Larsen, 2004) of vegetable fats and oils (soybean, sunflower, rapeseed, palm, canola) due to the advent of genetically modified organisms (Smith, 2003). This applies especially to soybean and corn products (Smith, 2003).

With respect to diet, several factors should be considered, including: increased consumption of high caloric sweeteners including sugar, high fructose corn syrup (Bray, Nielsen, & Popkin, 2004), artificial and natural sweeteners that are high in glucose, fructose, sucrose and saccharose (Popkin & Gordon-Larsen, 2004); increased intake of animal source foods (ASF) (Popkin & Gordon-Larsen, 2004); a shift from traditional dietary staples to westernized ones (Popkin, 1998), where rice and wheat have replaced traditional grains such as millet, corn, quinoa, amaranth; increased consumption of simple carbohydrates, particularly wheat-based
products (Montonen et al., 2013); increased consumption of foods prepared outside of the home and processed foods (Popkin, 1998); increased access to and consumption of soda (Go, Mozaffarian, & Roger, 2013); increased consumption of salty foods due to availability of fast food and imported processed food (Tuomilehto et al., 2001). Furthermore, the epidemiologic triad of obesity (Egger, Swinburn, & Rossner, 2003), indicates the complex ways in which multiple antecedents (Hosts, Vectors and Environments) interact to elevate the likelihood of obesity and other chronic diseases associated with the nutrition transition.

Physical activity is another influential determinant of the NT. This determinant has been greatly impacted by urbanization and the increased availability and consumption of technology in and out of the home. Technological advancements in labor-intensive sectors (such as agriculture) has led to a proliferation of tertiary services that require less physical activity (Popkin, 1998). Regarding technology and transportation, the availability of motor vehicles has decreased physical activity (Popkin & Gordon-Larsen, 2004). Sedentary lifestyles also increase with elevated population levels of television ownership and consequent media consumption (Popkin, 1998). Recent data collection among indigenous communities revealed that most households have a television. Television viewing influences child food preferences and snack food consumption as well as other food purchases at school (Albala, Vio, Kain, & Uauy, 2002). Television time has also been associated with soda consumption and consequent obesity in children (Giammattei, Blix, Marshak, Wollitzer, & Pettitt, 2003). Increased opportunities for a sedentary lifestyle with more time spent sitting has deleterious health effects such as obesity, diabetes and heart disease due to a lack of exercise (Hamilton, Hamilton, & Zderic, 2007).

Economic development is considered a major driving force of the nutrition transition globally. This also applies to indigenous populations in Ecuador. Increased rates of urbanization
has accelerated the spread of the nutrition transition in Ecuador, as with many other countries affected by urbanization and globalization (Dirocco & Cuvi, 2014). Market integration (Johansson, Klaesson, & Olsson, 2002) has caused a shift in economy across indigenous communities, from being primarily agrarian to tertiary sector focused. In Ecuador, many indigenous adults commute to cities to do a variety of jobs—men do construction while women work as domestic workers in urban households, or in flower houses. These data were obtained during focus groups conducted as part of the Syndemic HIV study in November. Higher income also means higher calorie intake - sweetener intake increases with income (Popkin & Gordon-Larsen, 2004).

When GNP reaches or exceeds $2500 per capita, obesity levels surge, thereby creating health inequities as a consequence of increased household income without corresponding increases in access to health services and nutrition education (Popkin & Gordon-Larsen, 2004). Increase in the number of dual income households means that mothers work outside of the home and thus delegate child care and child feeding to grandmothers, neighbors, and friends where possible. Focus group data collected among indigenous communities in Ecuador reflected that this change also signifies a decrease in the number of mothers who prepare meals and breakfast for their children, who in turn consume more food prepared at school or outside of the home. Poverty (Pedraza, 2009) has also been identified as a sociocultural determinant of obesity and should therefore also be considered an influential factor in the spread of the nutrition transition, which no longer applies to highly developed countries but has now spread to much poorer countries on account on urbanization and globalization. Researchers (Pedraza, 2009) have named this connection “obesity in poverty”. Subsequent researchers have
adapted this phrase to apply to the risk of chronic disease among the poor: “diabetes in poverty” (Dirocco & Cuvi, 2014).

**Nutrition Transition Impact on Health in General**

While much has been written regarding the mechanics of the nutrition transition at a population level, there is a paucity in literature that examines how the nutrition transition (NT) impacts individuals, their families and countries at a national level. This section examines the consequences of the NT at these levels.

At the individual level, health risks of the NT include the following: increased rates of cavities and dental problems across age groups (Price & Nguyen, 2016); sleep disturbances (Foley, Ancoli-Israel, Britz, & Walsh, 2004); increased comorbidity of chronic diseases (Must et al., 1999); increased incidence and prevalence of metabolic syndrome (Grundy, 2004); increased salt consumption elevates cholesterol which in turn facilitates heart disease (Tuomilehto et al., 2001); increased rates of abdominal adiposity due to unbalanced diet high in fat and sugar (Bruce-Keller, Keller, & Morrison, 2009); and an overall decreased quality of life due to an increase in disability associated loss of years (DALY’s) (Abegunde, Mathers, Adam, Ortegon, & Strong, 2007; Murray et al., 2015; Murray et al., 2013). Additionally, individuals may experience an increased reliance upon vehicles due to chronic diseases that may make movement difficult. This in turn reduces physical activity and perpetuate health risks in a vicious feedback loop. Obesity also carries with it stigma (Myers & Rosen, 1999) that is often subtle yet pervasive. Obesity may also impact social mobility (Pedraza, 2009) and employment prospects. Obesity also has deleterious psychological impacts such as low self-esteem, poor body image, depression and mental health disorders (Myers & Rosen, 1999).
At the family level, there are numerable consequences of the NT. These include: an increased likelihood of iron deficiency in adolescents and children due to unbalanced diet (Pinhas-Hamiel et al., 2003); and impaired cognitive function in adults due to poor micronutrient intake (Huskisson, Maggini, & Ruf, 2007). Additionally, television viewing lowers metabolic rates in children (Klesges, Shelton, & Klesges, 1993) which in turn poses the risk of adverse metabolic programming that can manifest in chronic disease later in life (Miller, Rosenbloom, & Silverstein, 2004). Moreover, the nutrition transition is also shifting family structure due to absent parents who work long hours and commute to work in cities in dual income households (Pocock, 2003). Work once done by women such as child care is now increasingly provided by market sources or from family, friends and neighbors who live and may provide care outside of the home (Pocock, 2003). Furthermore, cultural dietary shifts (a loss of the traditional diet consisting of locally grown produce, replaced by fast food and imported processed foods) signifies a loss of indigenous cultural identity for those who see traditional foods as symbolic of ancestral traditions and culture. Focus group data collected in Ecuador in the HIV study conducted in 2015 by Martinez-Tyson and colleagues reflected this concern.

Nationally, potential consequences of the NT include: Increased healthcare expenditures associated with increased rates of diabetes, heart disease, hypertension and chronic disease; an increase in Disability Adjusted Life Years lost (DALY’s); and increased per capita health care costs. It is noteworthy that, in time, elderly people who have multiple comorbid chronic diseases may live longer but with lower quality of life, thereby imposing a care-giving and economic burden upon their adult children who must now earn a living to provide for two generations – their aging parents and their growing children.
Pertinent public health functions impacted by this phenomenon include the field of epidemiological surveillance, health promotion, health communication, the application of health psychology and health education. Prior to the epidemiological transition, epidemiological surveillance focused on prevalence and incidence of infectious disease. The epidemiological transition (Omran, 1971), however, ushers in a new era in which surveillance strategies and tools increasingly focus upon the monitoring and prevention of chronic disease (Jaime, da Silva, Gentil, Claro, & Monteiro, 2013), which claims and compromises the masses in growing numbers. This transition to chronic disease prevalence also means that health educators and promotors need to find new ways to creatively promote a balanced diet and physical activity, in a world where processed foods and technology facilitate sedentary lifestyles and habits.

Public Health Significance of the Nutrition Transition

Our awareness of the NT heralds the need for prevention initiatives to target the lifestyle behaviors that perpetuate the NT. This awareness should therefore be translated into the formation of global, regional and national priorities. The significance of the NT in general is that globally, we are aware of a drastic and ongoing change in lifestyles that deleteriously affects health of population and, in so doing, has the potential to disrupt and or divert future country GDP as a consequence of increased health expenditures that arise due to increased disability caused by the rising prevalence of chronic diseases. The larger significance of this knowledge and its potential impact upon future generations should spur governments to take action while prevention remains a feasible option.
Historical Milestones of the Nutrition Transition

This section firstly gives a brief overview of history related to the advent of modern processed food, and, secondly, milestones regarding food laws in Ecuador. On June 30, 1906, President Roosevelt signed the Pure Food and Drug Act which led to the creation of the Food and Drug Administration (Warner, 2014). The spiritual progenitor of this body was a chemist named Harvard Wiley, who spent his career in government passionately lobbying against the use of chemical additives in food after a series of experiments he conducted that convinced him that processed food was harmful to human health and well-being. While his death in 1930 is not considered a historical milestone, it nevertheless marked the beginning of an era in which there was no one with Wiley’s scientific knowledge and passion for pure food to protect the American market from the subsequent deluge of processed goods such as Kraft processed cheese which flooded supermarkets soon after his death (Warner, 2014).

Other historical milestones regarding the nutrition transition relate largely to the genesis of the processed food industry and the advent of Big Food agribusinesses that promote genetically modified organisms. These milestones include the advent of Kraft processed cheese in June 1916 (Warner, 2014), the commercialization of toasted corn flakes by William Keith Kellog in 1906 (Warner, 2014), and the launch of genetically modified organisms (GMO’s) which took place at the turn of the century.

According to one CDC 2001 report quoted by the New York Times, roughly 80% of food-related illnesses were caused by pathogens that scientists could not identify (Warner, 2014); this finding corresponds to the approximate period in which genetically modified organisms became part of the American diet (Warner, 2014). On February 12, 1999, an independent panel of 23 world renowned scientists who examined data on genetically modified potatoes published a
memorandum indicating that there was clear evidence that GMO potatoes suppressed the immune system. Despite this effort, on May 23, 2003, President Bush current an initiative to end hunger in Africa using genetically modified foods. While this milestone appears tangential, it illustrates the growing momentum that culminated in the proliferation and inundation of genetically modified foods throughout the global food system. This is relevant to the nutrition transition in light of numerous findings that indicate that GMO foods have the potential to wreak havoc when interacting with human DNA, which in turn elevates the risk for cancer and a host of chronic disease as a result of population consumption of GMO foods that are cheaper to produce due to the built-in pesticide incorporated into plant DNA (Smith, 2003). These findings imply a disturbing possibility for the future of public health – cancer may be the new face of the nutrition transition in the years to come.

With respect to Ecuador, another historical milestone that affects the nutrition transition is Ecuador’s COMEX Resolution 011-2015 (March 6, 2015) (Vega & Beillard, 2015b). Effective March 11, 2015, this resolution impacted 461 food and agricultural product tariff lines. The resolution established a tariff surcharge of five to 45 percent for a period of 15 months on a wide range of goods, including U.S. consumer-oriented export products such as beef, pork, confectionary, and fresh fruits (including oranges and pears). While the reasons for imposing this surcharge were purely economic, with the ostensible intention of keeping as much local currency within the economy (rather than exporting currency in the purchase of foreign imports), an unintended consequence could be that this resolution stems the spread of market penetration of U.S. foods into Ecuador’s local distribution system (Vega & Beillard, 2015b). Additionally, Ecuador’s foreign trade committee (COMEX) also granted a wheat exemption to the application of this tariff upon U.S. sourced wheat imports (Vega & Beillard, 2015a). Ecuador is considered an insignificant producer of wheat and is
dependent upon imported wheat – the wheat exemption therefore ensures that wheat products remain affordable to Ecuadorean markets.

**Global and Regional Priorities and Milestones regarding Chronic Disease**

This section focuses primarily on global health priorities established by the World Health Organization in response to the rise in chronic diseases that result from the nutrition transition.

Table 1.1 below summarizes milestones regarding global health priorities related to dietary westernization and the nutrition transition.

**Table 1.1**

**Historical milestones regarding the Nutrition Transition**

<table>
<thead>
<tr>
<th>Year</th>
<th>Milestone</th>
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<tbody>
<tr>
<td>2004</td>
<td>The WHO Global Strategy on Diet, Physical Activity and Health was adopted by the World Health Assembly, overviews the strategies required to support healthy diets and regular physical activity. This Strategy called upon all stakeholders to act at global, regional and local levels to enhance diets and increase physical activity at the population level (Organization, 2016).</td>
</tr>
<tr>
<td>2007</td>
<td>The 2007 Declaration of Port-of-Spain (POS Declaration) took place, in which several Caribbean heads of state commit to create national action plans designed to mitigate the impact of rising rates of chronic disease ((PAHO), 2007).</td>
</tr>
<tr>
<td>May 2010</td>
<td>192 Member States of the World Health Organization endorse Resolution WHA63.14. This resolution aims to restrict the marketing of unhealthy food and non-alcoholic beverage products to children and teens in order to reduce the prevalence of overweight, obesity and diet-related noncommunicable diseases (Kraak et al., 2016; Organization, 2016).</td>
</tr>
<tr>
<td>September 2011</td>
<td>The Political Declaration of the High Level Meeting of the United Nations General Assembly on the Prevention and Control of Noncommunicable Diseases commits to advancing the implementation of the WHO Global Strategy on Diet, Physical Activity and Health (Organization, 2016)</td>
</tr>
<tr>
<td>2013</td>
<td>WHO develops the &quot;Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020&quot; which aims to achieve the commitments of the UN Political Declaration on Noncommunicable diseases (NCDs) which was endorsed by Heads of State and Government in September 2011. This “Global Action Plan” will contribute to progress on 9 global NCD targets to be attained by 2025, including a 25% relative reduction in premature mortality from NCDs by 2025 and a halt in the rise of global obesity to match the rates of 2010 (Organization, 2016).</td>
</tr>
<tr>
<td>2013</td>
<td>The World Cancer Research Fund International establishes the NOURISHING framework to monitor the progress of national governments to implement restrictions on the marketing of unhealthy food and beverage products (Organization, 2016).</td>
</tr>
<tr>
<td>Year</td>
<td>Event</td>
</tr>
<tr>
<td>------</td>
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</tr>
<tr>
<td>2013</td>
<td>The Access to Nutrition Foundation – a private health-related philanthropic institution – released its first <em>Access to nutrition index</em>, a global monitoring report that rates 22 transnational food and beverage manufacturers along nine indicators, which includes responsible food and beverage marketing practices. A perfect score of 10 indicates the highest level of coordinated actions to support responsible marketing to children and adults; while companies such as Danone, Unilever and Nestle improved their scores between 2013 to 2016, no company rated has achieved a perfect rating. This highest score was Danone with 8.5, followed by Unilever with 7.7 and Nestle with 7.4 in 2016 (Kraak et al., 2016; Organization, 2016).</td>
</tr>
<tr>
<td>2014</td>
<td>Rome Declaration on Nutrition, in which leaders attending this conference created an a declaration reaffirming their commitment to the WHO 2025 Global Nutrition Targets and the WHO Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020. They also acknowledged that some socioeconomic and environmental changes affect dietary and physical activity patterns, which in turn propagates vulnerability to obesity and noncommunicable diseases through increasing sedentary lifestyles and consumption of food that is high in fat, especially saturated and trans-fats, sugars, and salt/sodium (Organization &amp; Nations, 2014).</td>
</tr>
<tr>
<td>2015</td>
<td>Disney’s 2012 announcement to restrict junk food advertisements on child focused entertainment channels takes effect (Barnes, 2012).</td>
</tr>
<tr>
<td>2016</td>
<td>Nutrient profiling model submitted by PAHO in Washington, DC</td>
</tr>
<tr>
<td>2016</td>
<td>The World Health Assembly applauds the report of the Commission on Ending Childhood Obesity and its six recommendations to address the obesogenic environment and critical periods in the life course to tackle childhood obesity. The Assembly also requested the Director-General to develop an implementation plan to guide further action regarding the recommendations of this report (Organization, 2016).</td>
</tr>
</tbody>
</table>

**Economic ramifications of the nutrition transition.** These include a greater burden upon the working population that must care for ailing older adults together with obese and overweight children, a smaller workforce on account of DALYs (Disability Adjusted Life Years lost) due to chronic disease and premature mortality, greater per capita healthcare expenditures and overall healthcare costs, a greater burden upon the healthcare system that needs to treat a
population suffering from comorbid lifestyle diseases such as diabetes, hypertension and heart disease, increased demand for healthy foods vis-à-vis a lower supply due to the westernization of the global food system and increasing dependence of developing countries upon agricultural imports, inflation in foreign economies due to falling oil prices and increased U.S production of oil, and an increased cost of living due to the difficulties related to food affordability of healthy safe food. This in turn may further marginalize vulnerable populations who are already struggling with the challenges associated with low income.

Other public health principles (including ethical principles) that are important to consider for this topic include issues related to food availability, affordability, quality and safety (EIU, 2016). While this is not a great concern for Ecuador, this is not the case for other countries in the world where access to affordable healthy food is limited. Ethical principles regarding chronic disease prevention include the need to cater to marginalized populations, many of whom reside Andean Latin America. Fast growth of economies in these region contribute to their overall vulnerability to the epidemiological health shifts (Omran, 1971) that accompany urbanization and globalization. Data on overweight people in the Latin american and Caribbean (see Figure 1.3) states (LACs) region suggests that the proportion of people affected has grown exponentially, with rates growing from 33% overweight in 1990 to 51% in 2010 (Popkin & Slining, 2013). Data also suggests that the nutrition transition, combined with rapid urbanization in the LACs region, together work to close the previously wide gap in health status between urban and rural, with 52% of urban residents overweight, as compared with 50% overweight in their rural counterparts as of 2010 (Popkin & Slining, 2013). Overweight prevalence in Latin America and the Caribbean overall has increased to 51% ; rural and urban populations in the region are suffering similarly, as illustrated in Figure 1.3 (p.14, Popkin & Slining, 2013) below.
Similar findings have been reported for the Andean Latin American region, which consists of Peru, Bolivia and Ecuador (Moran et al., 2014). A recent global burden of disease study discovered that the rate of years of life lost due to heart disease in this region has steadily increased from 1990-2010, with a mean of 312,129 years lost in 1990 in both males and females to a mean of 437,785 years in 2010 (Moran et al., 2014). This means that the impact of chronic disease has affected more of the population within this time period. By extension, this statistic
signifies that the nutrition transition has real, measurable impact upon the health status and quality of life of people who reside in Andean Latin America.

**The public health significance of the nutrition transition in Andean Latin America.**

The nutrition transition also incorporates additional considerations such as the following: insight into the economic impact through DALYs and premature mortality due to chronic disease should spur the governments of Peru, Ecuador and Bolivia to take preemptive action to improve the quality of the population’s diet whilst encouraging higher levels of physical activity. Such preemptive action, if properly executed, can provide further insight into the health risks posed by the NT, potential solutions, and food system factors that facilitate or impede NT process in communities. Proper population health assessment regarding diet can also provide insight into household level dietary changes that should be the target of future household level interventions. Similarly, proper population health assessment regarding physical activity can facilitate future designs of interventions to increase physical activity at the household and individual level.

**Ecuador’s Burden of Disease**

According to the Global Burden of Disease study 2013 (GBD 2013) (GBD, 2016) (see Appendix B), malnutrition caused 3% of deaths and 7% of Disability Adjusted Life Years lost (DALYs); childhood stunting caused 0% of deaths and 1% of DALYs; childhood undernutrition caused 2% of deaths and 4% of DALYs; while childhood wasting caused 2% of deaths and 4% of DALYs. Furthermore, this GBD 2013 data clearly illustrates that the nutritional situation in Ecuador has improved greatly particularly with respect to (DALYs) due to nutritional deficiencies such as protein-energy malnutrition, iodine deficiency, Vitamin A deficiency, Iron-deficiency anemia and other deficiencies, the rates of which have decreased considerably, from 1663.9 per 100,000 in 1990 to 905.4 per 100,000 in 2013. Similarly, DALYs due to
communicable and infectious disease has also improved (Evaluation, 2016), affecting almost half as many people (5841·4 per 100,000) in 2013 as it did in 1990 (10913·3 per 100,000). Diabetes urogenital, blood, and endocrine diseases, however, have increased dramatically, from 1856·7 per 100,000 in 1990 to 2254·5 per 100,000 in 2013 and remain a problem that affects quality of life among the population with respect to DALYs.

This data corroborates the supposition that the epidemiologic transition (Omran, 1971) has taken effect in Ecuador, with a decrease in food scarcity related mortality and DALYs (Ervin et al., 2013), and a concurrently slow rise in the rates of mortality and DALYs due to chronic diseases such as diabetes mellitus and other endocrine, metabolic disorders, a concern associated with population dietary patterns that facilitate degenerative diseases (Ervin et al., 2013).

Data obtained from the World Health Organization (WHO), illustrated below in Figures 1.4 and 1.5, also indicates that chronic disease is a pressing public health concern for Ecuador (Organization, 2014). With a 12% probability of dying of a chronic disease (Organization, 2014), and an astounding 67% of population mortality (Organization, 2014) due to this cause, the impact and importance of the nutrition transition becomes strikingly clear at a national epidemiological level. This means that chronic disease has the potential to deleteriously impact national earning potential and GDP by virtue of its effect upon the working population, both in terms of individuals’ quality of life, DALYs and lifespan, all of which affect income-earning capacity.
Introduction Summary

This introduction examined the literature regarding the nutrition transition, both in a global context as well as within Latin America and Ecuador. Matters related to economic development, food availability, affordability and accessibility were also considered. In light of the global spread of the nutrition transition, Ecuador’s burden of disease was also addressed. Theories which guided the conceptualization of the current study were also reviewed. The following section gives an overview of the study’s aims and research questions.
Chapter 3. Theoretical Framework

Introduction

Theory serves multiple functions in the world of public health research. These include describing, explaining and predicting outcomes in various phenomena (Glanz, Rimer, & Viswanath, 2008). The current mixed methods study was designed to address several research aims; each respective aim was conceptualized using the guidance of different theories, namely syndemic theory, the Food Choice Process Model (FCPM) (see Appendix C), and positive deviance. Each of these theories and their application to this study will be discussed separately in the following sections.

Syndemic Theory

Overview, origins and historical underpinnings: Syndemics originated as a biocultural concept that later grew into a theory, one which considers the role of co-occurring deleterious social conditions in the clustering and interaction of disease incidence and prevalence among vulnerable and often marginalized populations (Singer, Bulled, & Ostrach, 2012). It originated in the work of medical anthropologists (Himmelgreen & Romero-Daza, 2010; Himmelgreen et al., 2009; Himmelgreen, Romero-Daza, Amador, & Pace, 2012) and has since diffused into the study of multiple diseases by a variety of disciplines (Singer et al., 2012). Broadly defined, syndemic theory postulates that co-occurring diseases and or social conditions augment the risk of diseases infection within a specific vulnerable population. In the current study, syndemic theory guided its conceptualization and the design of the Nutrition Transition Questionnaire. Despite its role
during conceptualization, a mismatch between syndemic theory and the study’s findings mean that syndemic theory was not used during data analysis. This mismatch will be further discussed in the discussion section.

**Syndemic theory and traditional applications.** Currently, syndemic theory is generally synonymous with the study of HIV, HIV risk and HIV vulnerable populations (Brennan et al., 2012; Dyer et al., 2012; Flanders, Gos, & Dobinson, 2015; Singer et al., 2006; Wilson et al., 2014). Syndemic theory has thus far been traditionally applied to the study of various infectious diseases that are sexually transmitted. Recently, however, emergent topics of study have branched off into chronic disease, including diabetes and depression.

**Emergent topic areas.** While Syndemic theory has been traditionally used to focus on comorbidities associated with HIV risk and or risky sexual behaviors among marginalized populations, researchers have recently begun to consider the syndemic occurrence of food insecurity among HIV vulnerable populations (Anema et al., 2011; Himmelgreen et al., 2009; Himmelgreen et al., 2012; Sellen & Hadley, 2011; Singer, 2011). Syndemic theory has also recently been applied to the study of suicide (Mustanski, Andrews, Herrick, Stall, & Schnarrs, 2014) and tropical diseases (Singer & Bulled, 2012). Strides have also been made in the application of syndemic theory to behavioral science and mental health research areas. For example, as part of their study of the biological and social pathways that may co-occur with HIV risk and food insecurity, Anema et.al (2011) included substance use variables (tobacco use, illicit drug use and lifetime alcohol dependency) in their analysis. This suggests that syndemic theory holds far greater potential than its current traditional focus of HIV vulnerable populations. In keeping with the ideas posited by anthropologists in several papers (Himmelgreen et al., 2009; Himmelgreen, Romero-Daza, Amador, & Pace, 2012), syndemic theory can also be applied to co-
occurring social phenomena such as urbanization, globalization, household dietary patterns and the nutrition transition. These phenomena are both cultural and social and therefore viable subjects for study with the application of a syndemic lens.

Syndemic theory has also begun to be applied to the areas of diabetes (Everett & Wieland, 2012) and chronic disease (Sattenspiel & Mamelund, 2012). Researchers have begun to see the potential of this application, as evident by the use of a biosocial model of eco-health to frame a study that examined the syndemics of nutritional insecurity in South Africa (Singer, 2011). This study, along with Himmelgreen’s influential work, (Himmelgreen & Romero-Daza, 2010; Himmelgreen et al., 2009; Himmelgreen et al., 2012), gives credence to idea of the blurry demarcation that distinguishes food insecurity from the nutrition transition (Egeland, Johnson-Down, Cao, Sheikh, & Weiler, 2011; Gulliford, Mahabir, & Rocke, 2003).

**Assumptions of syndemic theory.** The assumptions of this theory are straightforward. The theory assumes that diseases interact and thereby augment the risk of infection for vulnerable populations. The presence of multiple, co-occurring diseases and conditions produces additive effects, thereby increasing the burden placed upon overall population health (Brennan et al., 2012; Singer et al., 2012; Stall, Friedman, & Catania, 2008). Key constructs in this theory are the population of interest, the primary disease and its associated comorbid conditions and illnesses. It should be noted that the population of interest is often socially marginalized – the discriminated they suffer often compounds and elevates their risk for disease. Indigenous people are often marginalized and the subject of racism, making this theory appropriate for the current study, particularly given that chronic diseases are often comorbid, a serious ramification of the nutrition transition.
**Strengths of syndemic theory.** Syndemic theory applies a social justice lens to disease risk and the interaction of disease among populations. This constitutes a unique strength that merges epidemiology with the interests of anthropologists who are particularly conscious of the political economy of health, another theory which is closely related to syndemics and widely used among medical anthropologists.

**Weaknesses of syndemic theory.** While this theory provides a useful lens to frame our understanding of how deleterious social conditions such as poverty and discrimination can produce additive effects regarding disease risk, prevalence and incidence, this theory does not provide much insight into interpersonal and intrapersonal level factors that may contribute to disease patterns. Consequently, while this theory gives helpful ideas that can frame the larger context of the socio-cultural climate of a given disease, it is insufficient as a standalone theory and therefore cannot guide design and methodology as much as it can contribute to framing the analysis of big picture findings.

**Application of syndemic theory in current study.** Previously collected data suggests that the co-occurring social conditions of urbanization and globalization impact household dietary decision-making and behavior, which in turn results in the increased levels of fast food consumption and sedentary lifestyles that are endemic to the nutrition transition. Syndemic theory was used to analyze both emergent and a priori codes during applied thematic analysis, as illustrated in Appendix D.
Food Choice Process Model

Overview, origins and historical underpinnings. This framework was created by Jeffrey Sobal (Sobal et al., 2006) as a means of merging previous works (Connors, Bisogni, Sobal, & Devine, 2001; Falk, Bisogni, & Sobal, 1996; Furst, Connors, Bisogni, Sobal, & Falk, 1996), each of whom formulated theories of food choices based on qualitative interviews with different populations. The food choice process model (FCPM) incorporates three broad areas of examining the process of dietary decision-making: life course (trajectories, transitions, timing, contexts); influences (ideals, personal factors, resources, social factors, contexts); and personal system (values, taste, convenience, cost, health, managing relationships, other values such as quality, variety, symbolism, ethics, safety, waste).

The three broad areas of the FCPM (life course, influences, personal system) each contain key constructs (Sobal et al., 2006) that will be further defined in this section. Trajectories refer to thoughts, feelings, strategies and actions over the lifespan. Transitions refer to shifts that lead to changes or solidify continuation of behavior of food choice patterns. Timing refers to turning points in the lifecourse that influence food choice. Individual factors include which are physiological (genetic, personality), psychological (personality/mood), relational (identities, self-concept) factors. Resources include assets which may be physical (money, equipment, space) or intangible (time, skills, knowledge). Social factors include group norms and commensual dietary behavior such as roles within families, groups, networks, organizations, communities.

Personal food system key constructs. The personal food system was forwarded by Connors et al (2001). As described earlier, this component of the FCPM incorporates the processes through which influences eventually manifest into food choices in specific situations. The personal food system includes values, taste, convenience, cost, health, managing
relationships and identity values. In this framework, personal food system values incorporate the Set of considerations, personal interest, meanings, emotional affects and attachments that affect food choices.

Taste includes sensory perceptions such as appearance, odor, flavor, texture, etc. Convenience generally refers to time and effort, that is, the physical ability, and mental and physical involvement that it takes to prepare, consume, and clean up after meals. Cost generally comprises monetary considerations such as eating at home or out, a decision that is often dependent upon cost. Health refers to the physical well-being generated by food. Such benefits include weight loss, health weight maintenance and optimal functioning. Managing relationships refers to the social aspect of food consumption practices and traditions with others; often, the interests, needs and well-being of others in one’s social world are accommodated by one’s consequent food choices and preferences over time.

An example of this concept is couples who negotiate menus, food choices and child-feeding practices. Identity values incorporate quality, variety, symbolism, ethics, safety, waste religion. Religiously significant foods include beef for Hindus, as well as bread and wine for Christians. Cognitive factors within the personal system include classification system (Furst et al., 1996, value negotiation, balancing, and heuristic strategies. Classification System refers to the classification categories for food that people use to identify and group food options. Classification categories include all possible classifications; culturally recognizable classifications; socially significant classifications; personally operational classifications. Examples include “cheap” versus “healthy,” “unhealthy”, “expensive”, “we both like these foods”. Value negotiation refers to value prioritization that occurs concurrently with food rating
and choice options based on a hierarchy of salient values. Balancing ensures that salient food values are met, such as healthy foods during the week and desserts only during the weekend.

**Assumptions of food choice process model.** This framework implicitly assumes that we are all subject to influences of one form or another regarding dietary decision-making, a process that is highly contextualized. Thus multiple influences are simultaneously at work to affect any single food choice made by an individual for themselves or on behalf of their loved ones, as is the case with those who occupy the role of nutritional gatekeepers (Birch et al., 1980; Birch, Zimmerman, & Hind, 1981; Chadwick, Crawford, & Ly, 2013; Dalton & Wansink, 2006; Wansink, 2003, 2005, 2006).

**Strengths of food choice process model.** The strengths of this theory are that it makes meaning out of the messiness of multiple sources of influences which affect dietary behavior. Consequently, this theory is appropriate for the current study given its flexibility and openness to accounting for cultural and community level influences. It is comprehensive and ranges a wide spectrum of influences upon food choice: intra-individual, interpersonal, and the lifecourse.

**Weaknesses of food choice process model.** All data collection that contributed to this framework was conducted in the United States. Thus, there is likely some level of cultural bias and a lack of examination of macro level sources of influence outside of intra-individual and interpersonal levels. This theory, while appropriate for examining food choice influences at these levels, neglects to consider the following in details: household level variables; exposure to social media; culture; peer pressure and rituals; types of group norms; events/social functions such as potlucks; disordered eating and emotional eating; food insecurity; appetite stimulants and suppressants; motivations; traditions; status, power and prestige; as well as other psychosocial and socio-cultural factors associated with dietary behavior.
Application to other populations. This framework’s application in any population focuses on the content area of dietary behavior. It has not been tested in non-western, non-American populations and therefore may not consider all of the factors that influence dietary decisions in other cultures. Despite this shortcoming, it is sufficiently comprehensive and flexible to cater to the addition of food choice factors relevant to the indigenous population.

Application of the Food Choice Process Model in the Current Study. This theory provided a helpful starting place to frame the development of qualitative in-depth interview and intercept interview protocols in this study. It guided the development of research questions that aim to understand how Kichwas people decide what to eat and the decision-making process involved in family meal-planning and preparation.

Positive Deviance

Overview, Origins and Historical Underpinnings. Positive deviance is a process which applies one core question to the problem that researchers aim to fix: what are the uncommon practices that separate positive deviants(Pascale, Sternin, & Sternin, 2010) from their peers in a community where everyone is faced with the same challenges and conditions? In 1990, Jerry and Monique Sternin were called to Vietnam and presented with what appeared to be an unreasonable and impossible challenge. They were given six months before their visa expired. In those six months, officials expected these researchers to demonstrate measurable impact and positive change regarding the deplorable rates of child malnutrition that ravaged the postwar country. They ultimately solved the child malnutrition problem by teaching the community to imitate positive deviants, who regularly added shrimp and greens to children’s rice despite the belief that shrimp was an adult food.
**Key constructs of positive deviance.** The positive deviance approach may be considered a theory in action - it refers to a step-by-step process that flexibly caters to the unique needs of the different communities it serves. The steps of this approach are outlined below (Marsh & Schroeder, 2002):

1) Identify the health outcome that requires intervention and determine community health norms surrounding this outcome

2) Conduct a positive deviance inquiry to identify the positive deviants (4 to 6 people who have proved an exception to the rule despite being at high risk) and discover what they are doing differently.

3) Design behavioral change interventions to popularize adoption of positive deviant behaviors.

These interventions often take place in the home (i.e. Hearth) of one of the villagers.

**Assumptions of positive deviance.** This model assumes the following: a bottom up approach to change is the most effective way of sustaining positive health outcomes in resource poor communities; the solution to psychosocially embedded problems already exist within a given community or organization; discovering this secret means that one must first find the people who are equally at risk but prove themselves to be an exception to the norm of illness.

**Strengths of positive deviance.** The construct of positive deviance is very unique in that it has been practiced in many countries throughout the world and that shows a high-level of external validity and cultural competence. This model is sensitive to cross-cultural differences. For example, the project which began in Vietnam quickly spread to other countries where child malnutrition similarly improved.

**Weaknesses of positive deviance.** The most glaring limitation of this approach is the time intensive nature of the process. It takes considerable time, effort, political savvy and persuasion to get a community to opt in to the change process. Without the sweat equity of
positive deviance advocates who are community members, the initiative cannot move forward. Additionally, this approach is not appropriate for problems that are not psychosocial in nature and that require considerable technical expertise or technology such as a vaccine (Pascale et al., 2010).

**Application of positive deviance internationally.** Disseminating a PD approach that worked well in one community to another is not a matter of copy and paste. Each community must opt in of their own accord so that the implementation can be tailored to what they want. Self-discovery is a time-consuming aspect of this process. It should be noted that PD was specifically created and developed for use in a variety of international settings. This process of enquiry has been applied in over 40 countries throughout the world to a variety of pervasive social problems: breast-feeding in Burma (Zeitlin, Ghassemi, Mansour, & University, 1990); female genital mutilation in Egypt (McCloud, Aly, & Goltz, 1998; Pascale et al., 2010); antibiotic resistant bacteria in 3 U.S. hospitals (Pascale et al., 2010); and child malnutrition in Vietnam (Pascale et al., 2010) and a variety of countries including India, Indonesia, Ethiopia, Tajikstan, Haiti (Group, 2009; Pyle & Tibbetts, 2003).

**Application of Positive Deviance in the Current Study.** Given that the etiology of positive deviance began with child malnutrition in rural Vietnam, this topic is therefore especially applicable to the study of the nutrition transition among indigenous communities in the Andean region in Ecuador. PD provides a useful means of understanding two norms within indigenous communities: 1) The household dietary practices among resilient individuals who are able to maintain a healthy weight despite the prevailing trend of obesity; 2) The household dietary practices among high risk individuals who are overweight and obese, and therefore at an elevated risk of developing chronic disease. Application of a PD lens can facilitate the
development of an interview protocol for each subset of nutritional gatekeepers (high risk; resilient). This application therefore facilitates understanding of the behaviors that drive the nutrition transition as well as those that protect individuals from the risk of chronic disease.

**Theoretical Framework of this Study**

Before moving on to the methods and research design of this study, it is helpful to consider the guiding theoretical framework of this dissertation. This study was guided by the three theories outlined above: syndemic theory, positive deviance, and the food choice process model. An overview of how each of these theories influenced the conceptualization of this study design is provided below in Figure 2. Appendix D indicates how syndemic theory was applied to data analysis. Figure 2 below summarizes the ways in which these three theories influenced the conceptualization and study design of this dissertation.

<table>
<thead>
<tr>
<th>Strand A</th>
<th>Strand B</th>
<th>Strand C</th>
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<tbody>
<tr>
<td>NTQ survey</td>
<td>In-depth interviews</td>
<td>Ethnography</td>
</tr>
<tr>
<td>Syndemic theory</td>
<td>FCPM</td>
<td>FCPM</td>
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<td></td>
<td>Positive deviance</td>
<td>Positive deviance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Syndemic theory</td>
</tr>
<tr>
<td>RQ1: Explore the lifestyle patterns related to the nutrition transition</td>
<td>RQ3: Explore socio-cultural factors associated with the NT</td>
<td>RQ3: Explore socio-cultural factors associated with the NT</td>
</tr>
<tr>
<td></td>
<td>RQ3: Explore protective beliefs, behaviors and practices</td>
<td>RQ3: Explore protective beliefs, behaviors and practices</td>
</tr>
<tr>
<td>Individual level variables associated with major constructs of the nutrition transition: urbanization, globalization, physical activity, dietary patterns and health status.</td>
<td>Individual and household level dietary patterns, behaviors and processes that increase the risk of chronic disease.</td>
<td>Community level dietary patterns, behaviors and processes related to the nutrition transition. Special attention was paid to the nuances between high risk versus resilient patterns of dietary behavior.</td>
</tr>
</tbody>
</table>

Figure 2.0 Theory applied to mixed methods study research design
Theory Conclusion

Theory is both relevant and necessary to the design of research questions, methodology, and associated instruments/tools/protocols. Application of these three theories grounds conceptualization of this study, which thereby provides the basis of future nutrition transition research that is theoretically grounded. This theoretical anchoring is a critical contribution of this study – it can provide future researchers with a blueprint to follow in conducting future mixed methods research regarding the nutrition transition in other countries and cultures.
Chapter 4. Research Methods

Introduction

This chapter outlines the study’s research design then provides details regarding first quantitative methodology (Participants, Measures, Procedures and Analysis) followed by qualitative methodology (Participants, Measures, Procedures and Analysis).

Research Design

Study purpose. The purpose of this dissertation is to explore the key constructs of the nutrition transition as it relates to individual and household health status within Andean Kichwas households of the Imbabura province in Ecuador using a mixed methodology approach.

Study design. This study employed a convergent parallel design that employed sequential nested sampling in quantitative data and purposive criterion sampling for qualitative data; quantitative and qualitative data collection took place within the same one-year period. Due to feasibility limitations of the researcher, qualitative data collection took place within a one-month period, in July, 2017. Quantitative and qualitative sampling strategies that were applied in this study are outlined below. Specific study aims will then be addressed.

Research Design Rationale

The rationale for using mixed methods in this study appeals to existing gaps in the literature regarding two matters related to the nutrition transition: 1) The lack of a lifestyle assessment instrument to assess the lifestyles behaviors that protect from or increase the risk of chronic disease; 2) A corresponding lack of qualitative data that can be used to contextualize the
current dialogue that primarily focuses on econometrics data; 3) A paucity in scholarship regarding the nutrition transition among the Kichwas people of the Andes in Ecuador. The rationale of this study was therefore to address these gaps through the use of mixed methods, which ensures that the instrument devised captures relevant constructs related to the nutrition transition. For this reason, a convergent parallel design was used to explore the nutrition transition among the Kichwas people of Ecuador. Figure 1.0 on page 14 illustrates this convergent parallel design and the timelines of this study.

**Study aims.** The current study aims to: 1) Assess the content validity of the Nutrition Transition Questionnaire (NTQ), a pilot instrument designed to measure key constructs of the nutrition transition within indigenous Kichwas Andean households. 2) Assess the occurrence of chronic diseases (such as diabetes, hypertension, and high cholesterol) associated with the lifestyle risk factors of the nutrition transition among the study sample; 3) Explore relevant sociocultural factors (such as gender roles, culinary traditions, urbanization and globalization) which are related to lifestyle patterns within Kichwas indigenous households.

**Research questions.** Specific research questions that this dissertation aims to address are: 1a) What are the lifestyle risk factors of the nutrition transition among indigenous Kichwas communities?; 1b) What are the health outcomes associated with the nutrition transition among indigenous Kichwas communities?; 2a) Does the Nutrition Transition Questionnaire capture the most relevant factors regarding the nutrition transition among Kichwas indigenous communities?; 3a) How do gender roles and culinary traditions relate to dietary behavior and food choices within Kichwas households? ; 3b). What are the beliefs, traditions, and health practices that are related to household dietary patterns and food choice processes? ; 3c) How are urbanization and
globalization related to lifestyle patterns within Kichwas indigenous households?; 3d) What are the protective health beliefs, behaviors and practices that constitute resilience to obesogenic

**Sampling strategies overview.** Table 4.1 below summarizes sampling strategies for the various strands of data (Tashakkori & Teddlie, 2010), their respective target sample sizes, and inclusion/exclusion criteria.

Table 4.1

**Sampling strategies for current mixed methods study on the nutrition transition in Ecuador**

<table>
<thead>
<tr>
<th>Quantitative sampling strategy</th>
<th>Qualitative sampling strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strand A</strong></td>
<td><strong>Strand B</strong></td>
</tr>
<tr>
<td>Nutrition Transition</td>
<td>In-depth interviews,</td>
</tr>
<tr>
<td>Questionnaire administration,</td>
<td>$n=34$</td>
</tr>
<tr>
<td>$n=95$</td>
<td></td>
</tr>
<tr>
<td>Secondary data analysis:</td>
<td>Purposive criterion sampling:</td>
</tr>
<tr>
<td>Instrument administered by</td>
<td>• Age (18-70)</td>
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<tr>
<td>local study team as part of</td>
<td>• Kichwas</td>
</tr>
<tr>
<td>anthropometric study</td>
<td>• Separate households</td>
</tr>
<tr>
<td>Purposive Criterion sampling:</td>
<td>• Participants not related</td>
</tr>
<tr>
<td>• Age (18-70)</td>
<td>by blood</td>
</tr>
<tr>
<td>• Kichwas</td>
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<td>• Separate households</td>
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<tr>
<td>• Participants not related</td>
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<td>by blood</td>
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</tbody>
</table>

**Strand A Quantitative Analysis of Nutrition Transition Questionnaire.** Purposive criterion sampling (Tashakkori & Teddlie, 2010) took place in the Imbabura province, with a sample size of $n=95$. The NTQ instrument was administered by local study team members in Ecuador, who integrated this instrument into an anthropometric study that focuses on nutritional assessment related to the occurrence of metabolic syndrome among these communities. The local team, described further in quantitative administrative procedures, has a history of working well with the population – the strength of this relationship also adds credibility to the current study.
The sampling and recruitment strategy of this anthropometric study which collected data for Strand A is as follows. Local Kichwas community leaders provided the research team with census data containing a registry of names and their respective Kichwas households, grouped by community. The research team took this data and then selected Kichwas participants who met the following inclusion criteria: 1) Adults between the ages of 30-70; 2) Belonged to distinct and separate households in relation to other participants; 3) Were not related to other study participants by blood. The aim of this recruitment and purposive sampling strategy was to obtain a sample consisting of distinct households in order to reflect community level health norms within the towns surveyed.

**Strand B In-depth interviews.** Criterion sampling (Tashakkori & Teddlie, 2010) took place in the towns of Tukuru, Santa Barbara and Morochos. The inclusion criteria for this sample were women between the ages of 18-70 years of age who are the nutritional gatekeeper in their households (i.e., they make the majority of food purchasing and meal preparation decisions and thereby influence dietary preferences). Thirty-four interviews were conducted, which meets expert recommendations that saturation takes place within 12 interviews (Guest, Bunce, & Johnson, 2006).

**Strand C Ethnography and intercept interviews.** Snowball sampling (Guest, Namey, & Mitchell, 2012) was conducted to select food source locations and other areas in the community that are relevant to understanding food choices and the food system at a community level. Ethnographic intercept interviews (n=25) were conducted with vendors at dry goods stores, sellers at fresh food markets and customers of street fast food vending sites at various locations (the urban area of Otavalo and a countryside community known as Cotacacchi). These intercept interviews were conducted to obtain insight into the general public’s view of fast food, as well as
general food consumption and purchasing patterns.

Quantitative Methods

Quantitative methods introduction. There are currently no psychometric tools available to explore the nuances of nutrition transition as it occurs in communities. Furthermore, despite the voluminous literature on various factors that contribute to the increased risk and global prevalence of chronic lifestyle diseases, there is no existing theory that cohesively joins these factors together, nor is there any subsequent instrument available to public health professionals and physicians who wish to assess lifestyle risk and resilience regarding chronic disease. This dissertation aims to address that gap in the literature by creating and testing the Nutrition Transition Questionnaire (NTQ), which aims to assess key lifestyle constructs related to the nutrition transition.

Measures. The main measure that was created and tested with a small sample (n=95) was the Nutrition Transition Questionnaire (NTQ). This tool aims to serve as the foundation of a revised NTQ instrument that assesses individual lifestyle behaviors related to the nutrition transition. This revised instrument can be tested in further studies. The aim of this quantitative portion is to explore the content validity and inter-item reliability of a preliminary instrument that assesses key constructs related to the nutrition transition.

Development of the Nutrition Transition Questionnaire. Before going into further detail regarding the Nutrition Transition Questionnaire, it is first important to understand the development and analysis process regarding this pilot instrument. The purpose of the Nutrition Transition Questionnaire (NTQ) was to measure lifestyle risk and resilience regarding the nutrition transition. Key constructs included dietary habits that assessed items related to traditional meal consumption, fast food consumption, frequency of bread, rice and soda
consumption as well as sedentary lifestyles, assessed through items related to physical activity and access to technology. The target population was the Kichwas of the Andes in Ecuador.

Table 4.2a provides an overview of the process of NTQ development which was as follows. A test blueprint was created by generating a list of questions/items related to lifestyle: number of hours watching television daily, general physical activity level, frequency of fast food consumption, traditional meals and home-made meals. These items were generated through a combination of several sources: 1) A comprehensive review of the literature (see Chapter one); 2) Data provided by focus groups in a previous study conducted among this population (Chee et al., 2018; Chee et al., 2016); and 3) Consultation with local cultural and nutrition experts in accordance with the Delphi technique (Chambers, 2015; Hsu & Sandford, 2007).

Cultural and nutrition experts then reviewed the item pool and provided feedback. The items were revised through several iterations before a final preliminary version was created, along with preliminary scoring guidelines. This test instrument was then pretested and piloted among the target sample between September 2016- May 2017. These steps of development and analysis are summarized and outlined in Table 4.2a. After this development process, specific items were selected for further analysis, based on participant response rates and their contribution to alpha scores.

Table 4.2a

<table>
<thead>
<tr>
<th>Step in Instrument/Test construction</th>
<th>Steps in NTQ development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify purpose</td>
<td>To assess lifestyle risk and resilience regarding the nutrition transition.</td>
</tr>
<tr>
<td>Defined construct and content domain</td>
<td>Dietary habits: traditional meal consumption versus fast food consumption</td>
</tr>
<tr>
<td></td>
<td>Lifestyle: physical activity, access to Technology.</td>
</tr>
<tr>
<td>Table 4.2a continued</td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td></td>
</tr>
<tr>
<td>Identify target population (who)</td>
<td>The Kichwas of Ecuador</td>
</tr>
<tr>
<td>Create test blueprint or table of specification</td>
<td>A list of question areas was constructed: Tv watching, physical activity level, home-made meals, traditional meals, fast food.</td>
</tr>
<tr>
<td>Generate initial item pool (how)</td>
<td>Items were generated based on focus group data from a previous study in the literature on the nutrition transition.</td>
</tr>
<tr>
<td>Expert and layperson review of items (revise)</td>
<td>The initial item pool was reviewed by content experts in nutrition and the cultural experts on the Kichwas community.</td>
</tr>
<tr>
<td>Pretest items</td>
<td>The instrument was pretested within the community at the start of data collection.</td>
</tr>
<tr>
<td>Pilot test with target sample</td>
<td>Pilot testing took place between September 2016 and May 2017.</td>
</tr>
<tr>
<td>Develop guidelines for administration, scoring, interpretation of scores</td>
<td>A scoring plan was created at the time of conceptualization of the instrument and revised after data were collected.</td>
</tr>
</tbody>
</table>

### Steps in NTQ analysis process

| Identify specific domains that were assessed. | 1. Individual risk  
2. Individual resilience  
3. Oral health  
4. Chronic disease |
| Identify most relevant items under each domain based on response rates. | These items are included in the following tables which are outlined the specific questions that were selected for each domain. |
| Assess descriptives and frequencies of all relevant items. | Descriptives and frequencies gave a clear indication of the prevalence of specific lifestyle behaviors regarding food and exercise. |
| Standardized scores where applicable, in any domain consisting of items with Likert and dichotomous responses. | Standardization of scores using z scores was conducted for individual risk and resilience. Oral health and chronic disease, as dichotomous scales, did not require standardization. |
| Calculate average Z scores which function as cumulative scale scores. | Average Z scores were calculated for individual risk and resilience. |
| Calculate cumulative scores for dichotomous variables. | Cumulative scores were calculated for oral health and chronic disease. |
| Calculate alpha scores where applicable. | Alpha scores were calculated for all scales. |
| Calculate correlation between individual risk items and health outcomes where applicable. | Risk items included are all those indicated in Table 2.1a, under Risk. |
| Present descriptives and frequencies for items that could not contribute to the scores, cumulative scores or alpha scores due to lack of heterogeneity or low response rates. | Descriptives and frequencies were used to understand resilient behaviors within the sample. Additional demographics such as age and sex were also included in the descriptives and frequencies presented in the results. |
These items were grouped by scale: risk, resilience, chronic disease and oral health, and are illustrated below, in Table 4.2b.

**Participants and administration procedures.** Survey data (see Appendix E-I for English and Spanish versions of the instrument, informed consent forms and the bilingual semi-structured debriefing template) were collected by two Ecuador research team members, nurses who were interested in getting research experience in the field. These Mestizo nurses spoke Spanish natively, were insiders to the country of Ecuador but outsiders to the Kichwas community. The survey was administered in Spanish as an oral structured interview. Data collection was supervised by a senior research team member who has participated on several other community engaged research projects in Ecuador, whose main role was to facilitate recruitment of survey participants and to direct the survey administrators to interested participants in the community. Further details are included below. Each participant spent approximately one hour providing data. Data were collected through one-on-one survey interviews with participants, in the format of an oral structured in person interview, with the nurses orally administering the survey in Spanish and filling out responses. Items in the survey were individually read to the participants. Response cards were not used. Refusal rate was not documented. Similarly, participants who started and stopped was not documented. Their responses, if any, were not included in the final analysis. Data collection quality controls were difficult to implement given the distance of this community from the Ecuador lead liaison, who is based in Quito. The data collection supervisor, however participated in data collection as her schedule allowed.

Quantitative data were collected between September 2016 and May 2017. Data collection took place at participant’s homes in various communities throughout the Imbabura province, in
the mountainous Andes area, among participants who had limited access to transportation and lived a considerable distance from large cities. Participants were spread across towns that were roughly 50 miles apart at most. Inclusion criteria was that participants must be between 18 to 65 years of age, and identify as Kichwas speaking. Exclusion criteria were people who did not identify as Kichwas speaking and minors. Participant selection was decided by the senior research team member who supervised quantitative data collection. This team member was intimately familiar with items on this instrument and also participated in the Delphi technique, through which items were generated for this instrument. The Delphi technique incorporates consultation with content and cultural experts in the process of creating a new instrument or interview protocol (Chambers, 2015; Hsu & Sandford, 2007). Characteristics of the participants were that they spoke both Kichwas and Spanish, lived in the Imbabura province of Ecuador, and were between the ages of 18 to 67 years (n=95). The informed consent form, semi-structured interview debriefing templates used in the field, and IRB approval letters are indicated in Appendix (Appendices J-K respectively).

**Nutrition Transition Questionnaire domains, items and analysis.** Table 4.2b below illustrates specific item domains that were assessed which include: individual risk and resilience, oral health and chronic disease. The most relevant items for each of these domains were selected based on response rates within the sample. These variables, the NTQ question items, and their scoring are indicated below in Table 4.2b. Please note that chronic disease data were obtained as secondary data from the anthropometric study, which also administered the NTQ. This anthropometric study used various biomarkers to collect chronic disease data within the sample. Aside from measured chronic disease, all other NTQ items indicated below were obtained from data collected through self-report via the Nutrition Transition Questionnaire (NTQ).
Table 4.2b  
NTQ items included in analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Chronic disease outcomes from anthropometric study</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alpha=.416</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
<td>Yes=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No = 0</td>
</tr>
<tr>
<td>High Cholesterol</td>
<td></td>
<td>Yes=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No = 0</td>
</tr>
<tr>
<td>Metabolic Syndrome</td>
<td></td>
<td>Yes=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No = 0</td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
<td>Yes=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No = 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Oral health questions</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alpha=.52</td>
<td></td>
</tr>
<tr>
<td>Cavities</td>
<td>99. Do you have any cavities?</td>
<td>Yes=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No = 0</td>
</tr>
<tr>
<td>Loose Teeth</td>
<td>101. Have you lost any teeth?</td>
<td>Yes=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No = 0</td>
</tr>
<tr>
<td>Chewing Problems</td>
<td>103. Do you have problems chewing?</td>
<td>Yes=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No = 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Risk behavior questions</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alpha=.559</td>
<td></td>
</tr>
<tr>
<td>Bread</td>
<td>49. How many days do you eat bread per week?</td>
<td>0-7=0-7</td>
</tr>
<tr>
<td>Rice</td>
<td>51. How many days does your household eat rice per week?</td>
<td>0-7=0-7</td>
</tr>
<tr>
<td>Soda</td>
<td>54. How many days do you drink soda per week?</td>
<td>0-7=0-7</td>
</tr>
<tr>
<td>Fast Food</td>
<td>25. How often do you eat fast food?</td>
<td>Every day=6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2-3/wk=5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-6/wk=4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/wk=3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/month=2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/month=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Never=0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Resilience behaviors</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alpha=.248</td>
<td></td>
</tr>
<tr>
<td>Traditional Meal Consumption Per Month</td>
<td>22. How often do you eat local and traditional foods?</td>
<td>Every day=6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2-3 times/week=5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-6 times/week=4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/week=3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/month=2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/month=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Never=0</td>
</tr>
<tr>
<td>Individual Home-Made Meal Consumption Per Month</td>
<td>45. How often do you eat homemade food?</td>
<td>Every day=6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2-3 times/week=5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4-6 times/week=4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/week=3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/month=2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1/month=1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Never=0</td>
</tr>
</tbody>
</table>

*7 denotes 7 or more hours per day

*This variable includes eating meals together since culturally homemade meals are eaten as a family
Table 4.2b continued

<table>
<thead>
<tr>
<th>Family Home Made Meal Consumption Per Month</th>
<th>43. How often does your family eat homemade food?</th>
<th>Every day=6 2-3 times/week=5 4-6 times/week=4 1/week=3 2/month=2 1/month=1 Never=0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional diet consumption</td>
<td>18. Does your diet include corn, soups and potatoes?</td>
<td>Yes=1 No=0</td>
</tr>
</tbody>
</table>

Descriptives and frequencies gave a clear indication of specific lifestyle behaviors regarding food and exercise. Standardization of scores using z scores was conducted for individual risk and resilience. Average Z scores were also calculated for individual risk and resilience. Oral health and chronic disease, as dichotomous scales, did not require standardization. Cumulative scores were calculated for oral health and chronic disease. Alpha scores were calculated for all scales. Raw alpha scores were used when the scoring was identical between items. In all other cases, the standardized alpha was reported. Descriptives and frequencies regarding resilience and nevertheless useful in understanding behavior characteristics of the sample. Additional demographics such as age and sex were also included in the descriptives and frequencies; these are presented in the results section. Item total statistics and alpha scores were generated for each scale, as illustrated below in the following tables. Further tests were conducted upon these items to investigate correlations between individual risk and resilience items and various disease outcomes related to weight, chronic disease and oral health. Item statistics regarding items selected for analysis are indicated below.

Table 4.3 below illustrates the item total statistics for items (Fast Food Consumption Per Month; Soda, Bread and Rice consumption per week; Hours Watching Television Per Day) grouped in the individual risk scale of the instrument. These items gave a Cronbach’s alpha score of .559.
Table 4.3
Item total statistics: Risk

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Corrected Item-Total Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast Food Consumption Per Month</td>
<td>.7671</td>
<td>1.11206</td>
<td>.477</td>
</tr>
<tr>
<td>Soda Consumption Per Week</td>
<td>.9041</td>
<td>1.44496</td>
<td>.283</td>
</tr>
<tr>
<td>Bread Consumption Per Week</td>
<td>4.3699</td>
<td>2.23300</td>
<td>.268</td>
</tr>
<tr>
<td>Rice Consumption Per Week</td>
<td>2.6575</td>
<td>1.43584</td>
<td>.264</td>
</tr>
<tr>
<td>Hours watching TV per day</td>
<td>1.6164</td>
<td>1.02239</td>
<td>.237</td>
</tr>
</tbody>
</table>

**n=70; Alpha = .559**

*Note. All items in this scale had responses that were on a 0 – 7 Likert scale, with the exception of Fast Food Consumption Per Month, which has responses on a 0-6 Likert scale.*

Table 4.4 below illustrates the item total statistics for items (Traditional Meal Consumption Per Month; Individual Home-Made Meal Consumption Per Month; Family Home Made Meal Consumption Per Month; Traditional Diet consumption) grouped in the individual resilience scale of the instrument. These items gave a Cronbach’s alpha score of .248.

Table 4.4
Item total statistics: Resilience

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Corrected Item-Total Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional Meal Consumption Per Month</td>
<td>5.7976</td>
<td>.72444</td>
<td>-.022</td>
</tr>
<tr>
<td>Individual Home-Made Meal Consumption Per Month</td>
<td>5.9167</td>
<td>.56416</td>
<td>-.016</td>
</tr>
<tr>
<td>Family Home Made Meal Consumption Per Month</td>
<td>5.6667</td>
<td>.96109</td>
<td>-.034</td>
</tr>
<tr>
<td>Traditional Diet consumption</td>
<td>.9762</td>
<td>.15337</td>
<td>.354</td>
</tr>
</tbody>
</table>

**n=84; Alpha = .248**

*Note. All items in this scale had responses that were on a 0 – 6 Likert scale, with the exception of Traditional Diet consumption, which was a dichotomous, yes/no variable for the question of “Does your diet include corn, soups and potatoes? For this reason, z scores were used to calculate: 1) an average z score using responses to all of these items, and 2) a Cronbach’s alpha value of .248.*

Table 4.5 below illustrates the item total statistics for items (Cavities; Loose Teeth, Chewing Problems) grouped in the individual self-reported oral health scale of the instrument. These items gave a Cronbach’s alpha of .52.
Table 4.5
Item total statistics: Oral health

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Corrected Item-Total Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cavities</td>
<td>.7176</td>
<td>.45282</td>
<td>.289</td>
</tr>
<tr>
<td>Loose Teeth</td>
<td>.2824</td>
<td>.50265</td>
<td>.288</td>
</tr>
<tr>
<td>Chewing Problems</td>
<td>.2824</td>
<td>.45282</td>
<td>.436</td>
</tr>
</tbody>
</table>

n=85; Alpha = .52

*Note.* Items in this scale were dichotomous yes/no variables.

Table 4.6 below illustrates the item total statistics for items (Hypertension; Diabetes; High Cholesterol; Metabolic Syndrome; Weight Status) grouped in the measured individual chronic disease scale of the instrument. Together they give a Cronbach’s alpha score of .48.

Table 4.6
Item Total Statistics: Chronic disease

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Corrected Item-Total Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>.1500</td>
<td>.36162</td>
<td>.566</td>
</tr>
<tr>
<td>Diabetes</td>
<td>.0250</td>
<td>.15811</td>
<td>.043</td>
</tr>
<tr>
<td>High Cholesterol</td>
<td>.5500</td>
<td>.50383</td>
<td>.095</td>
</tr>
<tr>
<td>Metabolic Syndrome</td>
<td>.1750</td>
<td>.38481</td>
<td>.375</td>
</tr>
<tr>
<td>Weight Status</td>
<td>1.7750</td>
<td>.76753</td>
<td>.301</td>
</tr>
</tbody>
</table>

n=40; Alpha = .48

*Note.* These measures were obtained as secondary data collected by the anthropometric study which administered the Nutrition Transition Questionnaire. These items therefore reflect actual disease measures that were collected using a variety of biometric gauges.

**Qualitative Methods**

**Qualitative methods introduction.** Qualitative data collection consisted of in-depth interviews, intercept interviews, and ethnographic participant observation within the Kichwas community. The study setting is described below.

**Interview guides.** Interview protocols for intercept and in-depth interviews were developed using the Delphi technique (Chambers, 2015; Hsu & Sandford, 2007) in conjunction with consultation with the literature and guidance provided by previous research findings.
conducted among the Kichwas (Chee et al., 2018; Chee et al., 2016). Protocols were pilot tested in the field and adapted based on recommendations provided by local cultural experts before being implemented during data collection.

Qualitative data explored relevant sociocultural and lifestyle factors. Ethnography (Visser, Hutter, & Haisma, 2015) consisted of in-depth interviews and ethnographic participant observation within households and at various settings such as markets, groceries, gardens, restaurants, street food vending locations, and other places where food is either prepared or sold. These places were selected based on the recommendations of cultural experts as well as the participants themselves. Since recommendations came from a variety of sources across the community of interest, this method of choosing food-related establishments and settings eliminated bias within the ethnographic data.

**Qualitative sampling size.** Scholars suggest that qualitative sampling should be ongoing until saturation – the point at which further data collection reveals no new thematic information (Collins, 2010); experts indicate that 12 interviews is the typical timeframe that one can expect to achieve saturation (Guest et al., 2006). The qualitative sample size for the current study for in-depth and intercept interviews is thus based on the recommendations of Guest et al (2006).

In-depth interviews (n=34) were conducted in the community. These women met the criteria of identifying as Kichwas-speaking, resided in the Imbabura province, and were between 18-67 years of age, and acted as nutritional gatekeepers (women in charge of household meal-planning, as defined in Chapter 1). Based on previous research in Ecuador (Chee et al., 2018; Chee et al., 2016), women continue to play this role of nutritional gatekeeper within indigenous households. Consequently, interviewing such gatekeepers provided insight into the ongoing nutrition transition and the dietary behaviors.
Intercept interviews (n=25) were conducted at various food vending sites throughout the community with both vendors and customers of fast food. The purpose of these interviews was to get an idea of the perception and consumption of fast food, as well as purchasing trends at various dry goods stores throughout the community.

**Data collection.** In this study, interviews were appropriate to the research aims, which include an in-depth comparative exploration of the dietary practices of high-risk versus resilient households as it relates to chronic disease. In depth interviews offer the benefit of multiplex utility that includes detailed descriptions of processes, integrating multiple perspectives, and bridging intersubjectivities (see definition of terms section for this term) (Weiss, 1995). This study aims to obtain in-depth insight from the perspective of nutritional gatekeepers and community member via in-depth and intercept interviews respectively, making this method an appropriate choice for this study. Participant observation (Guest et al., 2012) through ethnography offered deeply contextual insights as a result of the intensity of the data collection process and the consequent richness of data that emerges – this method was thus appropriate for learning about the food environment that shapes the nutrition transition in indigenous communities. In this study, participant observation was conducted through everyday interactions with the community and included participant observation of cooking rituals in several families.

Qualitative data recording for debriefing primarily consisted of detailed ethnographic field notes, and debriefing templates (that were used for every interview). Given the extent of qualitative research current, it should also be noted that the researcher was the central tool of data collection (Janesick, 2016); this means that acknowledging agency and engaging in reflexivity (Langer, 2016) is vital to offset biases but cannot completely eliminate them (Walker, 2013).
Data collection team. Interviews were collected with the pair of nurses who administered the NTQ survey as part of the PUCE study. This was helpful since these nurses are familiar with the Kichwas culture, despite their mestizo status. It was important during data collection for participants to interact with someone from Ecuador in light of the cultural mistrust of foreigners within the Kichwas community, likely on account of their history of colonization and marginalization. On account of my outsider status (discussed in the positionality section), I conducted qualitative interviews alongside the two nurses who administered the NTQ survey among the Kichwas. These nurses travelled with me throughout the communities as we conducted in-depth interviews, intercept interviews, and a few sessions of participant observation where we helped women prepare meals. I conducted the interviews in Spanish and the notes taken during the interview were written into the debriefing template. These notes were then typed in Spanish in an excel document with columns that were formatted to match the sections of the debriefing template (see bilingual debriefing template in Appendix I). Data was analyzed in Spanish and translated to English when relevant quotes were selected for inclusion in the manuscript.

Data analysis. An exploratory approach was implemented when looking at qualitative data. This means that outside of the major a priori codes regarding the nutrition transition (urbanization, globalization, physical activity, dietary patterns and cultural shifts – see Appendix D), specific codes were not predetermined and that codes denoting emergent themes were derived based on the data (Greg, MacQueen, & Namey, 2012). Syndemic theory, positive deviance and the food choice process model was applied to both emergent and a priori themes (Appendix D). Thematic analysis involves highlighting both implicit and explicit themes at they emerge from the data (Greg et al., 2012). Inter-theme patterns shall be highlighted in the
discussion to glean a deeper understanding of co-occurring themes (Greg et al., 2012). This effort to support claims and inferences with themes that emerge from the data itself makes ATA as an analytic framework very similar to grounded theory with one key distinction – the main output is not necessarily a theory as it often is with grounded theory (Greg et al., 2012). The process which ATA does share with grounded theory is the following (Greg et al., 2012): reading transcripts to identify themes, exploring how these themes relate to one another regarding similarities, differences, patterns and structure (Charmaz, 2006). A distinction that separates ATA from grounded theory and phenomenology is that while they all encompass lived experiences relayed through an engaging narrative, ATA also incorporates quantification, which is generally not included in the former two. Such quantification includes cluster analysis and word counts where appropriate and applicable (Greg et al., 2012).

Debriefing templates were used to detail key findings and quotes at each interview (Greg et al., 2012). Several interviews were also recorded. In the event that transcripts are not possible due to funding restrictions, these debriefing templates along with ethnographic field notes (Emerson, Fretz, & Shaw, 1995; Thompson, 2014) were coded for meta-themes and themes. Review of these notes gave insight regarding the textual boundaries within debriefing templates that are most appropriate (Greg et al., 2012). Textual boundaries were decided based on the amount of text that most adequately captures the emergent meta-theme or theme (Greg et al., 2012). A detailed codebook was created to document meta-themes and themes (Greg et al., 2012). Subsequently, a qualitative data matrix was created that illustrates key themes and appropriate quotes to illustrate such (Greg et al., 2012).
Categories of dietary behavior used in data analysis. Dietary behavior was observed at the household and individual levels. Dietary behaviors were divided into three broad categories: risk, resilience, customs and traditions. At both the individual and household levels, specific risky dietary behaviors include consuming bread, rice, soda, fast food and double carbohydrate consumption as part of either lunch or dinner, while specific resilient dietary behaviors include eating traditional homemade meals, soups, consuming garden picked produce, and consumption of domestic livestock such as grass-fed cows, chickens (and their organic eggs) in addition to pigs. Culinary customs and traditions include the centrality of soup to the family diet, mothers teaching daughters to farm, dry, and sift corn and beans as well as plan and cook traditional homemade meals, mingas (i.e. collective practices centered around planting and sifting beans, corn, and potatoes, in addition to bread-baking in outdoor clay ovens) and the exchange of fruits and vegetables among friends and neighbors to diversify the family diet.

Ethical Issues and Solutions

Participants’ identity remained confidential. Names were changed to protect the identity of participants who participate in qualitative data collection. Electronic data were also deidentified. Identification numbers were assigned to track participants in quantitative data collection. Funding applications were submitted to the College of Public Health. An additional ethical consideration was the inherent distrust of the Kichwas people towards outsiders, particularly foreigners. To address this, members of the anthropometric study team who were familiar with the community assisted with qualitative data collection. During ethnographic data collection, time invested in building rapport with local Kichwas leaders as part of cultural immersion during ethnographic data collection proved invaluable to address this consideration.
Methods Summary

This chapter provided an overview of the mixed methods convergent parallel design; details regarding quantitative and qualitative methodology; and ethical considerations. The following chapter gives details related to results of this mixed methods study.
Chapter 5. Results

Introduction

Results were reported using a variety of techniques that include but are not limited to: A matrix of relevant research questions and emergent meta-themes (Greg et al., 2012); ethnographic vignettes (Langer, 2016); and photos of the food system and food vending (Guest et al., 2012). In order to maintain and strengthen ties to the research community, a final summary report was written in Spanish, and approved by local cultural experts as the final task of the Delphi technique (Balasubramanian & Agarwal, 2013; Hasson, Keeney, & McKenna, 2000; Hsu & Sandford, 2007; Powell, 2003). In this chapter, results will be presented by research question, with questions topics as section headings. Quantitative results will be presented first, followed by qualitative results.

Quantitative Results

Nutrition Transition Questionnaire demographics. The sample contained 24 men and 52 women with 13 having missing values; ages ranged between 30-67. BMI ranged between 19 and 37 with a mean of 27 and a standard deviation of 4.

Chronic disease, obesity and oral health. Two sets of the disease data were examined: 1) Self-report data included in the nutrition transition questionnaire; 2) Secondary data from the PUCE anthropometric study which measured chronic illness through actual biomarker measures.
While one person reported that they had diabetes, 2 people from the metric study were diagnosed with diabetes. Similarly, while only four of ninety-five participants self-reported hypertension, the anthropometric study found six people with this condition. Within the self-report data, no one reported heart disease or stroke, and for this reason the self-report variables were not included in further analysis. The highest disease occurrence indicated by anthropometric data revealed that 32 anthropometric study participants had high cholesterol (n=32) while seven had metabolic syndrome. Table 5.1a below illustrates the chronic disease occurrence in the study sample for whom biometric data was available, along with the alpha level of .416. High cholesterol was the most prevalent concern, with 32 people having high cholesterol in this study sample.

Table 5.1a
Chronic disease in this study sample

<table>
<thead>
<tr>
<th>Disease</th>
<th>Yes</th>
<th>No</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>2%</td>
<td>57%</td>
<td>59%</td>
</tr>
<tr>
<td></td>
<td>n=2</td>
<td>n=54</td>
<td>n=56</td>
</tr>
<tr>
<td>Hypertension</td>
<td>6%</td>
<td>38%</td>
<td>56%</td>
</tr>
<tr>
<td></td>
<td>n=6</td>
<td>n=36</td>
<td>n=53</td>
</tr>
<tr>
<td>High Cholesterol</td>
<td>37%</td>
<td>25%</td>
<td>41%</td>
</tr>
<tr>
<td></td>
<td>n=32</td>
<td>n=24</td>
<td>n=39</td>
</tr>
<tr>
<td>Metabolic Syndrome</td>
<td>7%</td>
<td>35%</td>
<td>58%</td>
</tr>
<tr>
<td></td>
<td>n=7</td>
<td>n=33</td>
<td>n=55</td>
</tr>
</tbody>
</table>

**Alpha= .416**

*Note. These items refer to measured chronic disease that was assessed using biometric data from the anthropometric study that administered the Nutrition Transition Questionnaire.*

Table 5.1b below indicates that there is some discrepancy between the perception of chronic disease risk versus measured rates within the study sample. Risk perception was measured through self-report yes/no items in the NTQ – (Do you have diabetes? Do you have hypertension?) – respectively, whereas measured illness rates were obtained through secondary data provided by the anthropometric study which administered the NTQ. Participants were also asked whether they had ever had a stroke or heart disease; since no one responded yes to these
items, they were not included in the analysis presented below in Table 5.1b, which illustrates the
difference in measured illness versus perceived illness in the study sample. This suggests a lack
of awareness of health susceptibility to chronic disease among the Kichwas surveyed. Their
belief in the healthful value of sunflower oil may be one reason why hypertension appeared to be
a health concern, a matter that will be discussed further in the discussion section.

Table 5.1b
Chronic disease rates versus perception in study sample

<table>
<thead>
<tr>
<th></th>
<th>Self-reported Hypertension</th>
<th>Measured Hypertension</th>
<th>Self-reported Diabetes</th>
<th>Measured Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>no</td>
<td>95.8% (n=91)</td>
<td>38% (n=36)</td>
<td>98.9% (n=4)</td>
</tr>
<tr>
<td>yes</td>
<td>4.2% (n=4)</td>
<td></td>
<td>6% (n=6)</td>
<td>1.1% (n=1)</td>
</tr>
<tr>
<td>Total</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>95</td>
</tr>
</tbody>
</table>

According to the Centers for Disease Control, Body Mass Index (BMI) is a biometric
health measure that indicates body fat and thus serves as a risk indicator of additional chronic
conditions (CDC, 2018). BMI below 18.5 is considered underweight; 18.5 – 24.9 signifies
healthy weight; 25.0-29.9 signifies overweight; and 30.0 and above is considered obese (CDC,
2018). Table 5.1c below illustrates the distribution of these CDC defined BMI categories across
the Kichwas surveyed in this study. The overweight BMI category was the most occurrent, with
22 people falling into this category, although it should be noted that this finding is not conclusive
given that 19 people fell into the healthy weight category. BMI ranged between 18.7-37.2 for the
study sample.

Table 5.1c
BMI and weight status

| BMI               | Range=18.7-37.2 | Mean=27.36 | St.Dev=4.08 | N= 55
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Status</td>
<td></td>
<td></td>
<td></td>
<td>Missing=40</td>
</tr>
<tr>
<td>(created based on BMI)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy Weight</td>
<td>20% (n=19)</td>
<td>23.2% (n=22)</td>
<td>14.7% (n=14)</td>
<td>42% (n=40)</td>
</tr>
</tbody>
</table>
With respect to oral health, cavities (n=62) were the most prevalent concern, although loose teeth (n=22) and chewing problems (n=26) were also reported. These results are summarized in Table 5.1d below, which shows the oral health variable of interest (cavities; loose teeth; chewing problems) and the corresponding question from the NTQ used to collect data for this variable, along with the percentage and number of respondents who answered yes, no or for whom data was missing for that question. The alpha level (.52) for the oral health domain is also indicated in Table 5.1d below.

Table 5.1d
Oral health in study sample

<table>
<thead>
<tr>
<th>Construct</th>
<th>Question from Nutrition Transition Questionnaire</th>
<th>Yes</th>
<th>No</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cavities</td>
<td>99. Do you have any cavities?</td>
<td>65%</td>
<td>27%</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>n=62</td>
<td></td>
<td>n=26</td>
<td>n=7</td>
</tr>
<tr>
<td>Loose Teeth</td>
<td>101. Have you lost any teeth?</td>
<td>23%</td>
<td>77%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>n=22</td>
<td></td>
<td>n=73</td>
<td>n=0</td>
</tr>
<tr>
<td>Chewing Problems</td>
<td>103. Do you have problems chewing?</td>
<td>27%</td>
<td>65%</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>n=26</td>
<td></td>
<td>n=65</td>
<td>n=4</td>
</tr>
</tbody>
</table>

**Alpha = .52**

Based on the availability of disease data for the sample, it is difficult to draw substantive conclusions regarding chronic disease occurrence among the participants surveyed, both by the nutrition transition questionnaire, as well as the preceding anthropometric study. Furthermore, the lack of response variability in self-report questions suggests that, despite concerns regarding chronic disease voiced by participants of previous studies, and by several in-depth interviewees, the quantitative sample surveyed in this study showed a very low perception of disease susceptibility with respect to diabetes, hypertension, heart disease and stroke. For the latter two, all participants responded ‘No’ to the questions of ‘Do you have heart disease’ and ‘Have you ever had a stroke?’.
**Individual risk.** Table 5.2 illustrates the inter-item Pearson’s correlation of the question items which made it to the final analysis of individual risk: bread consumption per week; rice consumption per week; soda consumption per week; fast food consumption per month; eating out as a family per month; watching television in hours per day; and self-reported physical activity. The alpha value of these items was .535. Table 5.2 illustrates specific item correlations between fast food frequency per month, as well as soda, bread and rice consumption per week.

Table 5.2
Correlations: Overall risk and specific items

<table>
<thead>
<tr>
<th></th>
<th>Fast Food Frequency Per Month</th>
<th>Soda Per Week</th>
<th>Bread Per Week</th>
<th>Rice Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average z score self-risk scale</td>
<td>Pearson Correlation</td>
<td>.679**</td>
<td>.577**</td>
<td>.619**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td></td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td></td>
<td>94</td>
<td>94</td>
<td>92</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

**Individual resilience.** Four items were included in the final analysis of resilience: traditional meal consumption; homemade meal consumption; family home made meal consumption; and traditional diets. These items were converted to z scores to standardize response data. Please refer to the Methods chapter to see these items.

**Nutrition Transition Questionnaire Salience and Content Validity**

This section addresses the research question of: Does the NTQ capture the factors that are related to the nutrition transition among Kichwas indigenous communities? Findings presented below focus on inter-item correlations and alpha values within scales. Inter-item correlation analysis of risk and resilience indicate that for risk, every item selected for final analysis was significantly correlated at the .01 level. Resilience items were not significantly correlated.
Findings of alpha analyses were less conclusive on account of a high level of homogeneity within responses. This lack of response variability contributed to low alpha scores and low inter-item correlations, particularly within responses to resilient items. More than 75% of the NTQ respondents provided the same response to resilience items. A lack of response variability throughout the sample, in conjunction with the study’s small sample size, together violate the assumptions of the alpha statistic. Further investigation with a more diverse sample is needed to make conclusions about whether the protective behaviors that were intended to capture resilience are most salient or require additional items.

It should be noted, however, that significant inter-item correlation findings regarding risk suggests that these items captured key constructs related to lifestyle risk regarding the nutrition transition among the Andean Kichwas of Ecuador. Of all scales measured, risk had the highest level of variability and, consequently, the highest alpha score of .56, which further corroborates the conclusion that risk does indeed measure salient lifestyle behaviors regarding the nutrition transition. A summary of scale and alpha values are included in the methods chapter.

Quantitative findings would have been difficult to understand and contextualize without the support provided by triangulation with ethnographic data which provide possible explanations of what appears to be low perceived levels of personal CNCD susceptibility and potentially low levels of disease occurrence within the study sample. Triangulation with qualitative data present a striking and unexpected finding – the Kichwas communities surveyed by the nutrition transition questionnaire appear to live somewhat resilient lifestyles. This resilience is notable, given that many of the NTQ participants were over 40 years of age. Additionally, the agricultural lifestyle of the Kichwas people who live in Cotacachi, Tukuru and Santa Barbara facilitates easy access to fresh fruits and vegetables, together with high-quality
grass-fed meat as well as poultry and pigs raised on ancient breeds of organic, non-genetically modified corn (choclo) and produce cultivated in nutrient rich soil.

**General correlations.** Pearson correlations were conducted to explore the connections among age, sex, BMI and health outcomes in this sample. Findings are as follows: Age and total chronic illness was positively and significantly correlated (p=.021); sex and BMI were also positively and significantly correlated (p=.04). Interestingly, age and risk were inversely but significantly correlated (p=.04). Table 5.3 illustrates these findings by presenting correlations regarding Age, BMI, Sex, Chronic disease, Oral health, and Risk.

**Table 5.3**
Correlations: Age, BMI, Sex, Chronic disease, Oral health, Risk

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>BMI</th>
<th>Sex</th>
<th>Total Chronic</th>
<th>Total teeth problems</th>
<th>Risk average z score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>1</td>
<td>-105</td>
<td>-015</td>
<td>.363*</td>
<td>.054</td>
<td>-235*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.456</td>
<td>.901</td>
<td>.021</td>
<td>.661</td>
<td>.043</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>75</td>
<td>53</td>
<td>75</td>
<td>40</td>
<td>69</td>
<td>75</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>-105</td>
<td>1</td>
<td>.283*</td>
<td>.253</td>
<td>.102</td>
<td>-109</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.456</td>
<td>.040</td>
<td>.115</td>
<td>.477</td>
<td>.427</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>53</td>
<td>55</td>
<td>53</td>
<td>40</td>
<td>51</td>
<td>55</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>-015</td>
<td>.283*</td>
<td>1</td>
<td>-.045</td>
<td>.099</td>
<td>-038</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.901</td>
<td>.040</td>
<td>.782</td>
<td>.416</td>
<td>.744</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>75</td>
<td>53</td>
<td>76</td>
<td>40</td>
<td>70</td>
<td>76</td>
</tr>
<tr>
<td><strong>Total chronic disease</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.363*</td>
<td>.253</td>
<td>-.045</td>
<td>1</td>
<td>-.132</td>
<td>-.073</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.021</td>
<td>.115</td>
<td>.782</td>
<td>.444</td>
<td>.654</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>36</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total teeth problems</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>.054</td>
<td>.102</td>
<td>.099</td>
<td>-.132</td>
<td>1</td>
<td>-.010</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.661</td>
<td>.477</td>
<td>.416</td>
<td>.444</td>
<td>.929</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>69</td>
<td>51</td>
<td>70</td>
<td>36</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td><strong>Resilience average z score</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson Correlation</td>
<td>-.058</td>
<td>-.100</td>
<td>.139</td>
<td>-.222</td>
<td>.081</td>
<td>.125</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.622</td>
<td>.472</td>
<td>.235</td>
<td>.174</td>
<td>.462</td>
<td>.234</td>
</tr>
<tr>
<td>N</td>
<td>74</td>
<td>54</td>
<td>75</td>
<td>39</td>
<td>84</td>
<td>93</td>
</tr>
</tbody>
</table>
Individual risk and resilience items were correlated with each disease outcome separately. Of these analyses, there was only one significant finding: rice consumption per week was significantly correlated with high cholesterol, with a Pearson Correlation value of .375, with p=.005 significance. It is possible that response homogeneity and missing data in measured chronic disease may explain why resilience was not correlated negatively with any health outcomes.

**Qualitative Results**

Table 5.4 below summarizes interview participant characteristics obtained from a demographic questionnaire that was administered prior to each semi-structured interview.

Demographic presented in Table 5.4 below include: age, household size, and smartphone ownership. Physical activity questions regarding television watching were also included in this demographic questionnaire, along with household dietary behavior such as whether children prefer fast food and pasta soup (*sopa de fideo*). These themes are in bold font in Table 5.4 below.

### Table 5.4
Summary table of interview participant demographics

<table>
<thead>
<tr>
<th>Number of Participants</th>
<th>n=34</th>
<th>Percent age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age range</td>
<td>24-79</td>
<td></td>
</tr>
<tr>
<td>Household size: 4-6 household members</td>
<td>18/34</td>
<td>53%</td>
</tr>
</tbody>
</table>

**Physical activity**

| Watches 10 hours of television (weekdays) | 15/34 | 44% |
| Does not watch television (weekends) | 12/34 | 35% |
| Eats while watching tv (Snacks) | 13/34 | 38% |
| Does not eat while watching tv (Does not snack) | 14/34 | 41% |

**Dietary behavior**

| Children prefer fast food & pasta soup | 3/34 | 9% |
| Children prefer traditional soups | 13/34 | 38% |
| Mothers teach daughters how to cook | 30/34 | 88% |

**Table 5.4 continued**

| Women cook what is available “Lo que hay” | 18/34 | 53% |
| Home-made meals cooked every day | 34/34 | 100% |
| Food advertisements do not affect children’s food choices | 21/34 | 68% |

**Access to and utilization of technology**

| Owns a smartphone | 15/34 | 44% |
| Does not own a smartphone | 19/34 | 56% |
General Dietary Trends among the Kichwas People

The Kichwas’ closeness to the land is particularly influential regarding food choices. Soups serve as a meaning of stretching family resources. The distance from the farm to the plate mitigates food choices. Based on ethnography, it is also a reasonable extrapolation that, by extension this distance is related to chronic disease risk, – the longer the distance, the more likely chronic disease is a risk due to the use of chemicals, preservatives, a loss of freshness of the food.

Traditional foods include quinoa, amaranth, ancient corn that is known as “choclo”, various beans, potatoes, and white turnips that are known as “zanahorias blancas”. Meat is often boiled in the water that is cooking the grains so that it also infuses the food with flavor. The traditional condiment that is used to add flavor to these bland meals is a sauce known as ahi, which is made from blending ahi peppers with lemon juice, adding salt and “tomates de arbol” (a type of nightshade that resembles an orange Roma tomato with a denser texture and tomato-like flavor) to the blender, then topping it with raw red onions.

Other notable findings include: the freshness of fruits, vegetables and meat; grass fed beef is the norm; richness of the soil means that plants absorb nutrients and this nutrient richness enriches the quality of livestock meat; delicacies such as guinea pigs play a biocultural role in that their rich diet of herbs and alfalfa very likely addresses nutrition gaps in the local diet and can thus provide an occasional boost. Organic eggs are highly treasured. The large variety of exotic fruits makes a diversity of nutrients easily available. The value of organic food is made clear in organic markets that are held on Sundays in most cities – there, organic produce is sold directly from farmer to public at the price of one dollar per pound of organic fruit. Cooking their own meals is very important – daily cooking rituals involve cooking for at least two hours a day.
Additionally, while the mall has a small food court, a very large space there is dedicated to raw beef, pork, chicken, dried grains and fresh fruits and vegetables. It would not be difficult to pick up a pair of leather shoes from Colombia together with a pound of fresh beef on the way home.

**Lifestyle Risk Factors among the Kichwas**

**Sunflower Oil Consumption.** During participant observation, when community members were asked why they consume so much sunflower oil, they consistently responded that they believe it is very healthy. Sunflower oil is ubiquitous in Kichwas cuisine, both home-made food and restaurant food. In walking through the corner stores and grocerries, I observed that it was sold in bulk – several shelves if not an entire wall filled with large bottles of sunflower oil for sale. I even recall seeing three large (albeit empty) barrels of sunflower oil in one family’s backyard. This dietary trend, coupled with foreign nature of cardiovascular exercise outside of daily chores, and double consumption of carbohydrates at meals (usually pasta and rice or rice and potatoes) may together explain why high cholesterol was the most prevalent chronic health issue in the sample. The high rates of cholesterol in the study sample is the clearest sign of dietary westernization in the context of the nutrition transition.

**Impact of geology, geography and ecology.** Geology is defined as “the science that deals with the earth's physical structure and substance, its history, and the processes that act on it”, while geography is defined as a discipline that focuses on the “description, distribution, and interaction of the diverse physical, biological, and cultural features of the earth's surface”; ecology is considered a discipline which studies “the interrelationship of organisms and their environments” (Merriam Webster dictionary). For the purposes of this dissertation, use of the term geology encompasses geography as well, given the overlap between these fields of study. Ethnographic field work provided considerable insight into the horticultural lifestyle of the
Kichwas in the Imbabura. Relevant geographical characteristics of the environment in the Cotacachi area include: high altitude, the steep slopes of the Andes, and the importance of livestock to the livelihood of the people. Ecological considerations there include the fertility of the soil and its ability to grow a wide variety of fruits and vegetables and climate that affects horticulture. Cold temperatures make it difficult to grow fruits, which means that in higher altitudes such as in the remote communities or Morochos, the diet focuses on grains such as corn since that is what they can grow. Together, these factors in turn affect transportation to and from these areas, which in turn affects access to produce.

Environment contributes to both risk and resilience. High altitude and cold climates make it difficult to grow fruits in some areas, however such high altitude and challenging slopes, together with the lack of transportation for women (while some families own cars, most of the men use these for their commute to and from work) means cardio exercise for women who walk daily, safety means physical activity among children and teens. Space for many pets means crops and homes are protected while children are lured outside to frolic with their pets whom they cherish a great deal. While mothers participated in interviews, they washed laundry or sifted dried corn or beans as their children played with puppies and one other. Cats protected crops while dogs protected the family and children as they moved about the community, playing in the fields while their mothers worked outside. The following ethnographic vignette illustrates how the complex ways in which environment is related to physical activity and dietary risks.

Close to midnight one evening, I remember hearing the raucous sounds of boys at play. Parents had already turned in for the night so I knew there was likely no adult supervising. My curiosity piqued, I ran outside, following the sounds of dogs growling at each other and teenagers outside. My feet took me to a basketball court where a group of teen boys played basketball with fervor. Dogs stood guard nearby, engaging in their own territorial showdown with one another. It become clear to me that parents
sleep peacefully at night knowing that their children have the family’s bodyguards nearby. These dogs follow the children about during the day time as well, so that children move about freely outdoors beneath the watchful eyes of their ubiquitous pet companions. One village elder revealed to me that this is why families often have several dogs – for protection of the entire household and the children. Cats also protect crops from rodents – a critical role since corn and beans are harvested from the field then laid out to dry before being sifted by the family. Thus, while cats and dogs facilitate safety for crops and children in this horticultural community, so that crops can be dried and children can play and engage in physical activity, the environment also facilitates physical activity in another way – the steep slopes, lack of transportation and heavy loads that women must carry (loads of corn as heavy as fifty pounds on their backs) serve to integrate cardiovascular and weight-bearing exercise throughout the natural course of the day. No wonder the women think that their daily chores constitute sufficient exercise!

Ironically, while the impressive altitude presents ample opportunity for physical activity, it also presents a challenge for some Kichwas. Eight thousand feet above sea level is suited to exercise and hot enough to grow citrus crops. For communities such as Morochos, however, that are closer to ten thousand feet above sea level, their cold climate makes it difficult to grow citrus and access other fruits that cannot grow at such chilly temperatures. They are thus dependent upon fruit trucks, which have a difficult time getting to them since the roads are a combination of rock and dirt paths that make it difficult to distribute produce regularly. In these cold climates, the villagers primarily consume corn, beans, rice and potatoes in various soups combinations.

**Thermoses for packed lunch.** One participant revealed that they do not eat cold food and for this reason, men who work in the city or commute far away to work eat fast food. Consequently, when subsequent interviewees were asked whether they would consider purchasing a thermos to keep food warm in order to avoid eating *comida chatarra*, several (n=11) were in favor of the idea. One interviewee noted that only those who work in offices and cannot return home to eat lunch would be interested in purchasing a thermos for lunch. Another interviewee made quite a striking comment – that she would pay however much it cost because it
was worth the investment. Others indicated that they could not afford it although it was a good idea. This participant was also very eloquent regarding her perception of the connection between comida chatarra and chronic illnesses such as diabetes, heart disease, high cholesterol, and hypertension.

**Child food preferences.** While a few participants indicated that their children prefer fast food and pasta soup (n=3), the majority indicated that soups (n= 13) were quite popular among their children, as well as traditional food (n= 7). Soups, also referred to as coladas, include rice soup, a traditional soup known as mazamorra which is made from a combination of bean flours which forms the broth base, to which potatoes, rice, chicken (or guinea pig for special occasions such as weddings) and seasoned with dried cumin and scallions. Rice soup is a broth soup, also seasoned with scallions, to which rice and various vegetables are added. Colada de maiz is corn soup while there is a dessert soup made from a white squash known as zambo. This latter dessert soup is consumed with corn tortillas, which are made from corn flour that is cooked on large clay plates over the fire. It should be noted that several children (n=7) requested foods they saw advertised, however the majority of children preferred home-made traditional soups.

**Soda consumption.** Soda, referred to as cola, is more a feature of community festivals than daily lifestyle. Soda is also stocked in greater quantities in the city rather than the agricultural countryside. While households did partake in soda consumption, and most interviewees indicated that although all family members drink cola (21 households), it is not a daily occurrence, but rather several times each month. Cola also appeared to be part of cultural festivities, since several participants indicated that parties are generally when they are most likely to drink cola/soda. Additionally, ethnographic field work made it clear why this was
possible, since cultural festivities are always occasions in which soda, fast food, grilled corn, ice cream, sweets, and other comida chatarra are readily available and consumed in celebration.

**Health Outcomes associated with the Nutrition Transition among the Kichwas**

According to interviewees, diabetes, hypertension, and high cholesterol were the most pressing health issues that they faced (n= 9). Among NTQ participants, 12 households reported having family members with chronic diseases while 3 participants were themselves diagnosed with one or more such illnesses. Quantitative data indicates that while diabetes is not extremely prevalent (n=2), high cholesterol (n=32), high blood pressure (n=6), being overweight (n=22) and obesity (n=14) are bigger health concerns.

**Gender Roles, Culinary Traditions and Dietary Behavior**

**Food is a woman’s work.** The majority of women work at home. Given that meals and food constitute the main job of women, the presence of homemakers works as a protective factor against the nutrition transition for the majority of families. In the words of one elder, the woman is the chief of the home – “la mujer es el jefe de las casa”. Therefore, from planting, reaping, drying and all the way to cooking, food is the main job of women in Kichwas communities. Additionally, activities that surround food production involve the entire family, for example, doing mingas (the Kichwas word for the collective work of the family and community) to do food and agricultural activities.

**Role of men in food.** When asked, several participants (n=6) shared that men’s main role regarding feeding the family is that of provider. Men usually go to work to earn an income while women manage the earnings to shop for food at various markets. Markets are usually chosen based on a combination of either price or proximity. Despite stereotypes of traditional cultures in which women serve men who perform few domestic tasks, findings of this study indicate
otherwise. Participants (n=5) consistently shared that their husbands helped with food-related
tasks when they were home. Some even shared that their husbands helped with all aspects of
food-related chores, sharing in decision-making regarding menus for the week, planning meals,
shopping for food together, and assisting with cooking, meal preparation and clean-up.
Participant observation confirmed this since no men were home during the day during the
cooking sessions; however, at the home of my host, I had the privilege of observing that her
husband would routinely wake up early on weekend mornings, play music on the loud speakers
and proceed to clean the kitchen, washing dishes and cleaning counters, which allowed his wife
the precious luxury of sleeping in.

**Mingas.** Mingas refer to collective activities related to food cultivation and food
preparation. These activities include bread making, planting and reaping corn, potatoes, beans
and other crops, as well as sifting dried corn and beans. While conducting interviews, I
participated in a minga with a group of women where we sat in a circle around a pile of corn and
beans, sifting each into separate bags – an old Kichwas woman participated in an interview as
another woman in the group translated between Kichwas to Spanish. My participation in this
minga, and my willingness to help, contributed to rapport building during the interview. Another
example of a minga for breadmaking is described using the following ethnographic vignette:

My host made bread this evening. Two types of bread were made –
corn bread and wheat flour bread. A group of us circled a large
bowl of dough, grabbing dough, swiveling it, shaping it into
crescent and dropping it onto a metal pan. My host’s father-in-law,
a Kichwas elder, walked up to the women and casually gossiped
with them as he joined into the bread-making activity. I discovered
that breadmaking with the outdoor clay oven is a big family event
which requires several hands. The clay oven has to be heated up
many house in advance. The oven even has a name - Carmen
Rosita. Named after a deceased relative, the oven “refuses” to bake
good bread unless meat is first cooked inside on the night that
bread must be baked. For this reason, when my host planned to
bake the bread she cooked meat first…When the oven’s coals cooled off sufficiently, after cooking the meat, the metal trays of bread buns are shoveled into the oven. Breadmaking is not only a culinary event but a social gathering. The gossip continues late into the night as family members and friends talk and gossip around the dough whilst different batches of bread are placed and removed from the oven…breadmaking is an example of collective group work, called a minga, in which the community comes together to either bake bread, sow potatoes, plant corn or reap and sift it. Later that evening I discovered that breadmaking in my host family is an annual tradition which occurs either in November or December, when they bake 27 pounds of bread, which is solely for the family’s consumption.

**Food choice heuristics.** When asked how they decide to choose what to cook for a given day or meal, all participants responded in the same words - “Lo que hay” (“what there is”) (n=18) – meaning that they cook what is available. At the outset, while this response appears simple, it is in fact a penetrating insight into the lifestyle of the community and the heart of the kitchen within each household. Here, among the Kichwas, the prevailing decision heuristic is availability. The proximity of produce that is readily available in specific areas, particularly those where home gardens are prevalent – is influential in determining the family diet. Thus, the idea of food availability and accessibility as the primary food choice heuristic, is consistent with the culture and lifestyle among the horticultural Kichwas, who live close to the land and, given their lack of transportation, are heavily reliant upon horticulture for their survival.

Food choice heuristics within this community are largely governed by practical matters of availability and accessibility, rather than food as a reward or as the result of food advertising. It should thus be noted that, for the majority of interview participants, that commercials did not affect their food choices. During interviews, most if not all participants responded with a blank expression when they were asked whether commercials affected their food choices. Thus the question of “Do food commercials affect what you choose to eat?” appeared to confuse
participants since they generally view food purely as a source of nutrients and fortification. By extension, ethnographic work corroborated that food as a form of emotional reward was a strange concept in this culture.

Evidence of the foreign nature of this idea is demonstrated not by actual words but by the lack thereof – not a single community member or interview ever used words denoting emotion in conjunction with food. Statements such as “I eat this food because it makes me feel good” or “I eat this as a reward for something I accomplished” or “I choose the foods I crave” never came up. Instead, when asked about their food choices, food availability (“lo que hay”, meaning “what there is”), and accessibility (in this case accessibility refers to access to home-grown produce cultivated in *huertos*, or home gardens) were the consistently the prevailing food choice heuristic. Interviewees lit up with excitement, eager to show off their *huertos* when asked for a tour, either at the beginning or end of interviews.

Additionally, ethnographic observations also indicate that the freshness and organic nature of produce are influential food choice heuristics in this culture. It was not uncommon for large hands of bananas, piles of citrus and other fresh produce to grace the kitchen countertops of many families.

**Kichwas-Mestizo/Foreigner tension and cultural barriers.** An unanticipated finding during ethnographic field work is that there exists an unspoken tension between the Kichwas people and Mestizos, which is the name given to descendants from Spanish conquerors who, over time have intermarried with indigenous people on occasion. With or without intermarriage, those who are of Spanish descent are considered Mestizo, and, given their tumultuous history of colonization, conquest, subjugation, marginalization and discrimination, there exists an ongoing tension between the two groups. Mestizos maintain their own unique culture, to the point where
a mestiza woman who marries an indigenous family must withstand considerable opposition from her Mestizo family and give up her Mestizo world to assimilate into indigenous culture. This intercultural tension is relevant to this study for two reasons: 1) Researchers who conduct work among indigenous populations are usually Mestizo and therefore must be creative in adapting to complications which may arise; 2) Language barriers between Kichwas and Spanish make research a challenge; 3) This tension translates to an inherent mistrust of foreigners of any kind – people (be they Mestizo or otherwise) who do not belong to the Kichwas community. The Kichwas people are thus overtly reserved in the presence of outsiders, a cultural nuance that bears consideration in future work among this population.

**Dietary trends and risks.** Meals often include both rice and potatoes or rice and pasta. This pattern of having two forms of carbohydrates with each meal signifies a risk factor that can increase the possibility of chronic diseases.

**Intergenerational differences and culinary traditions.** Nearly all interviewees (n=30) indicated that cooking is a tradition that is handed down from one generation to another, particularly as it relates to a variety of traditional dishes. In the words of one participant, “Yes, I teach my children to cook, as my mother taught me to cook grains, rice soup (*arroz de cebada*), and corn soup (*colada de maiz*).” Traditional dishes passed down from one generation to another include *mazamorra* soup (a wedding dish made from a nutrient rich broth of bean flours that have been seasoned with green onions in a large pot before adding in either chicken of guinea pig as the main meat, along with fresh corn, known as *choclo*), rice/vegetable soup (*sopa de arroz de cebada*), quinoa soup, corn soup with guinea pig and eggs, squash dessert, and various soups. *Mazamorra* soup, often made with either chicken or *cuy* (i.e. Guinea pig), is a Kichwas delicacy that is reserved for special occasions.
One participant observation session included the preparation of *mazamorra* soup, which was prepared using a variety of flours made from corn flour, wheat flour ground bean flour and seasoned with roasted cumin. The thick paste of flours is then added to a large pot of boiling water, where roughly one pound of scallions has already been incorporated to flavor the broth. As the participant cooked this meal, serving beans and corn on the side, her young son casually kept her company as she cooked, playing a musical instrument at the dining table as we ate lunch together. By contrast, *sopa de arroz de cebada*, another popular soup that features rice, scallions and beans, cooked during another participant observation cooking session – is a daily dish that regularly frequents the family menu. Learning to make this dish revealed that intergenerational culinary traditions are an enduring cultural practice which serves as a form of quality time between family, friends, neighbors, elders, parents, and their children.

Diets have also changed gradually over time, incorporating foods higher in sugar. One interviewee furnished details about how diets have changed: “Before we used to eat more grains, now we eat more fruits and yogurt.” Another said: “Today they eat rice and potatoes; before it was more grains.” The popularity of rice and potatoes described here was also observed during ethnographic field observations, where meals containing both these carbohydrates were not uncommon – it served the purpose of stretching meals to make people feel full despite small portions of protein.

**Home-made meals and general food choice trends.** Based on participant observation, ethnography and in-depth interviews, home-cooked meals, or *comida del campo* constitute the mainstay of household dietary practices among the rural Kichwas of the Imbabura province. All interviewees (n=34) indicated that they generally stick to a traditional diet consisting of ancient grains and vegetables that were incorporated into their home-cooked meals. Many interviewees
indicated that they spend an average of two hours cooking each day and that home-made meals are what the family eats in general. These home-made meals consist primarily of items such as “fruit juice, eggs, tea, soup with rice and vegetables, beans, rice, meat, salad”. Interviewees also shared that dinner may either be a repeat of lunch or bread with tea. Participants eloquently shared their view of the health benefits home-made traditional meals. They highlighted a number of valuable attributes regarding their ancestral diet that include:

- *It is good, because it makes us stronger. After eating fast food, it makes us hungrier.*
- *It is the best, it has many vitamins.*
- *It is healthy and good and does not contain chemicals, and for these reasons we like to eat it.*
- *It maintains and sustains us, it protects our bodies so that we do not get sick.*
- *They are natural because they use less chemicals.*
- *The food is bearable for our stomach, country food makes us strong.*

**Urbanization, Globalization, and Kichwas Lifestyle Patterns**

The population of this study was affected by urbanization only in the sense that men commuted to work in the city while their wives worked the land. Given their lack of access to technology and vehicular transportation, the rural agricultural Kichwas of this study remained fairly insulated from the ramifications of globalization. The finding that participants did not understand the idea that cable advertisements could influence their food choices appears to corroborate this conclusion. Thus when asked, most of them (n= 22) indicated that their children’s food choices are not affected by food advertisements. Only seven household indicated that children’s food preferences are affected by commercials, while only three interviewees were themselves similarly affected. Those who were affected by the urbanization were largely city-goers who ate fast food that was readily available at bus stops, corner shops that sell dry goods
and various restaurants throughout the city. Urbanization does, however, appear to affect meal timing within the community.

Yes, it affects us, how we eat and what we want to eat, if we are home we can eat something healthy. Those who work in offices do not carry lunch – we have already lost that tradition; but here in the indigenous community we are accustomed to carrying lunch, for example beans and potatoes.

Another participant summarized the impact of working hours in this way:

Yes it affects us because our working hours means that we do not eat at the times we normally would at home they do not have good nutrition.

Protective/Resilient Health Beliefs, Behaviors and Practices

Bio-economic system tied to horticultural way of life. Conversation with a community elder revealed that years ago, between 1970 and 1980, children suffered from malnutrition due to a lack of access to vitamins and minerals from fruits and vegetables. She explained that the leaders of the Kichwas social and economic organization met and decided to share seeds throughout the community; they also taught women to incorporate fruits and vegetables by sharing various recipes throughout the community. Over time, this evolved into a way of life where fruits and vegetables are ubiquitous in household meals and recipes.

The organization also gave us oranges, lemons, parsley, culantro, ahi peppers, garlic, onion, which we plant around the fields so that we don’t have any plagues. Mint we plant and keep close to the doorways so that mosquitoes do not enter. We have cats to help and eliminate rodents, dogs for protection. In communities we do not do separate physical activity but we consider countryside labor sufficient exercise, which includes giving animals water, washing clothes by hand and working in agriculture.

For example, stone ground ahi (ahi de Piedra) is a popular condiment that consists of pureed ahi peppers (that have a distinct spicy-sweet flavor similar to scotch bonnet), a fruit named tomate de arbol (i.e. tree tomato – a cross between a mango and a roma tomato), raw red
onions, salt, and lemon juice. This condiment is eaten with dinner and lunch, and is particularly favored as an accompaniment with meat, corn, beans and soups of every kind. This elder also shared that neighbors and friends exchange fruits and vegetables in a barter system; women also earn extra money by selling these fruits whole as vendors or by making fresh juices at juice stands throughout various towns. In so doing, the bio-cultural relevance of the diversity of fruits and vegetables attains economic significance since it creates economic opportunities for women to earn extra income for their families by selling juices and other dishes that incorporate these fruits and vegetables – roasted corn; hot cider made with mora berries and roasted meat. The elder’s stories thus revealed that there exists an intricate ecosystem which surrounds the process of feeding the family. In this way, the horticultural way of life facilitates the development of a food economy that incorporates an exchange of fruits and vegetables between neighbors and friends that serves to diversify the family diet. Additionally, the logic she shared about the reason why plants such as mint are put near doorways and the function of pets in the community demonstrated the biocultural role of various traditions that had evolved over time.

**Fruits and vegetables are a way of life.** Participant observation among the Kichwas led to the observation that fruits and vegetables are a way of life among the Kichwas. Fresh fruits and vegetables regularly grace the countertops of nearly every kitchen I saw. Large hands of bananas hang from the ceiling and, in other homes, fruits such as papaya, mangoes, and apples are displayed on dishes or in baskets on kitchen counters. This attests to the refrigerating benefit of the cold climate as well as the centrality of fresh produce to Kichwas culinary customs and traditions. Fruits and vegetables are generally incorporated into every recipe, a result of the elders’ distribution of seeds and recipes to combat child malnutrition in 1980’s or 1990’s.
Environmental safety, physical activity and the biocultural role of pets. The bio-economic system mentioned above by the elder also includes: cats to protect the plants from rodents; dogs to protect the home and children; a culture that promotes fruits and vegetables in various recipes to facilitate the proper development of infants and children. Pets also facilitate exercise and outdoor physical activity among children and teenagers. Even as interviews were conducted, the sight of children playing with puppies was a commonplace occurrence. I observed children and teenagers with their dogs or livestock, taking a walk up the hill as they took their livestock to graze in nearby grass fields. In these communities, cows are kept tied at night and families pay a monthly sum (roughly 30$ USD) for the privilege of taking their livestock to graze at specific grass fields during the day. It should be noted that the vast space of farmlands allow families a measure of space that urban families do not access; with dogs standing guard and trusted neighbors who also work the corn fields outside, children are free to enjoy the safety of the countryside and are fairly physically active.

One night I remember being shocked to hear boys playing basketball at a nearby basketball court – since it was near midnight. These teens regularly play basketball and other sports well into the night – parents go to bed early and are not fearful for their children’s safety. Thus, the security and collective culture in the countryside create an environment that also facilitate physical activity for children. Women walk for exercise when there is time - the majority believe that the household tasks are sufficient for the daily access. The concept of cardio exercise does not exist in this community nor in this culture. While woman value all that is natural, fresh and without chemicals in the diet, exercise is not a concern.
**Organic food consciousness.** Interviewees (n=3) indicated that one of their concerns regarding diet and disease was the perceived connection between cancer and *quimicos* (chemicals), *transgenicos* (genetically modified foods), and *fumigacion* (pesticides) on plants and hormones and antibiotics in meat. In the words of these two participants:

- Previous generations ate well, but today the food has more chemicals, before it was healthier, I am afraid that children get sick with diarrhea, fever, stomach cramps, these were not concerns before.
- Previous generations it was not sprayed with pesticides, now there are a lot of chemicals.

Ethnographic field work confirmed this concern - there are organic markets every Sunday in many cities such as Ibarra and Cotacacchi, while there are stands with slogans that promote a food culture free of *transgenicos* (i.e. genetically modified foods). This strong awareness of the importance of organic food, i.e. food without chemicals and preservatives, is the reason that country chicken (i.e. organic chicken) and eggs are highly valued in this community. Organic chicken, known as *pollo del campo* is thus considerably more expensive than its counterpart and has a flavor similar to duck.

**Fast food consumption.** When asked about their thoughts on fast food, interviewees most often said that fast food is not healthy and causes chronic illness. One interviewee shared “It is bad. Children eat it – they don’t like grains, they eat fried potatoes, eggs and sausages.” Others commented on its nutritional content – “It is not worth it because they have burnt oil, also they do not have vitamins”. Other interviewees indicated that they considered fast food the source of chronic diseases like diabetes, while others showed concern regarding chemicals in the
food (i.e. preservatives, hormones, antibiotics and pesticides) and cancer. Fast food was not regularly consumed in the majority of households, with eight participants indicating that their families consumed it once or twice a month and three interviewees with households that consumed fast food once a week. One participant even shared that they only eat it four times a year. Only one interviewee indicated that their household consumes fast food every day and two shared that they do not eat fast food at all in their homes. Three intercept interviewees indicated that they eat fast food twice a week. These three also shared that fast food “causes obesity, overweight” and “it makes us sick and fat” and that it also creates “high cholesterol”.

Access to technology. Technology access in this population primarily consisted of television watching. Fifteen of 34 interviewees indicated that they watch ten hours or more of television each day during the week but 17 interviewees indicated that they do not watch television during the weekend. Only eleven interviewees had access to the internet and for the fifteen households who had access to smartphones; 14 interviewees indicated that only one family member had a smartphone. This means that television is the primary form of access to technology for the study participants.

Despite the popularity of television watching, when asked, few interviewees indicated that their food choices (n=4) or that of their children (n=7) were influenced by advertisements. In the words of one interviewee: “What they watch affects what they ask us to cook”. Among this population, it appears that media does not generally affect food choices for the majority of households surveyed. Furthermore, the lack of access to transportation, internet and smart phones appear to be protective among this population as they facilitate physical activity and prevent sedentary lifestyles. In this rural community, the women walk everywhere; even if the family owns a car, men are the drivers. In this landscape of high altitude and sloping
mountainside, women who carry large loads of corn (some of which looked to weigh more than fifty pounds at the very least), or young children on their backs obtain both cardiovascular exercise and weight lifting resistance exercise that facilitates health and physical strength far into old age.

**Home gardens and livestock.** The culture of having an herb garden (n=11), pigs, cows and chickens has two functions- to feed the family and present an economic opportunity for woman sell food, fresh juices and fruits that they grow. Produce grown includes: tomatoes, avocados, mora berries, carrots, large onions, *babaco* (a large round brown fruit with a black seed at its center), lemons, limes, collard greens, spinach, ahi peppers, grapes, mandarins, swiss chard, cabbage, kale, fava beans, radishes, herbs such as *culantro* (a cousin of cilantro with a strong flavor and used throughout Latin America and the Caribbean as a seasoning for meat) and lemongrass, corn, varieties of several beans and apples. One participant who lived in a town located at a particularly high altitude said: “When it is abundant we sell it, the onions corn beans that we grow, fruits we cannot because of the climate here.”

The majority of food grown serves to feed the family and livestock – four participants used identical words: only for the consumption of the family (“solo para consumo de las casa”). Interviewees revealed that the many pounds of dried corn and beans that they sift continuously during the day – is devoted entirely to family and their domestic livestock consumption.

Furthermore, those with fruit and vegetable gardens, known as *huertos*, have a distinct advantage – they are able to simply walk outside their house, pick the needed produce, and add it to their pots and plates. For example, they can pick ahi peppers, scallions, lemons, and *tomates de arbol* (an orange fruit that resembles a cross between a ripe mango and a roma tomato), add it to onions and lemon juice – make their ahi sauce to accompany their lunch of quinoa soup with rice
on the side, and then pick the sweet white squash and make a delicious dessert with the squash that is served with corn tortillas. Observing this over time, it became clear that one key finding of this work is that the distance between the tree and the plate influences the variety and quality of food. In so doing, the distance between tree and plate appears to mitigate the risk of chronic disease – the longer distance, the more that food loses its vitality, freshness and requires chemicals, preservatives and packaging. Among the Kichwas, the privilege of eating food fresh off the vine – influences their lifestyle in many subtle ways that include an abundance of freshly harvested fruits and vegetables on kitchen countertops, that are soon used in menus that rely mainly on fresh herbs and ingredients rather than complexity of seasonings.

**Cultural identity in food.** During interviews, *la desculturización* was not mentioned as a concern, given that the rural Kichwas farmers of this sample, unlike the urban Kichwas of previous studies, maintain a strong connection to their traditional diet. This sample maintained their cultural identity tenaciously – daily diet generally consisted of ancient grains, beans, pork, chicken or beef and a rich assortment of soups. Soups stretch family resources and feed more family members with limited rations of protein on a small budget.

**Botanical medicine and the Mama Pacha religion.** The Mama Pacha religion is a syncretic blend of Catholicism and the ancient indigenous faith system in which Mama Pacha represents the protectoress of the earth, much like the figure of Mother Earth that graces the paintings of famous indigenous Ecuadorian artist Guayasamine. I had the good fortune of meeting a Mama Pacha shaman of Ibarra (a town famous for its shamans) during my stay among the Kichwas. This shaman’s role was both spiritual and medical in the community, since some community members turned to her as an alternative to western medicine. They readily imbibed the herbs and botanical combinations she prescribed for their corporeal and spiritual complaints.
My host mother shared one story of how this shaman helped her son and husband overcome the trauma of a car accident through a shamanic ritual. In my encounter with the shaman, she treated a young woman for work related stress by conducting a ritual that involved a female guinea pig, that, like the woman, had never given birth. The shaman burned incense then passed the guinea pig over her body, much like a metal detector or a body scan. Then she cut open the guinea pig and, in examining its organs as a doctor would an xray, told the young woman of other ailments that required treatment. She then prescribed two liters of herbal tea made from 29 plants (*29 plantas*), an herbal tea concoction used to treat and promote reproductive health in both men and women.

**Results Summary**

Results indicate that the key constructs of the nutrition transition are salient to both the nutrition transition and nutritional trends within the community. Risky dietary behaviors include eating bread, rice and soda. Protective or resilient behaviors include access to gardens, eating homemade meals, and eating a traditional indigenous diet. Oral health problems included cavities and loose teeth. Hypertension, high cholesterol and obesity/overweight were among the most prevalent chronic illnesses. Qualitative data revealed that the traditional diet was a major component of indigenous identity; men participate actively in food planning and preparation when they are not out working; an active bio-economic system of trading fruits and vegetables among friends and family diversified the household diet as well as creating cottage industry opportunities for women to gain extra income through the sale of street foods, and fresh fruit drinks; numerous dogs as pets serve to protect the family, particularly when children are at play in the countryside. Additionally, one promising intervention to reduce fast food consumption is the use of thermoses to keep food hot, since they do not eat cold food and are thus drawn to
street food when they are far from home. Triangulation of quantitative and qualitative data also shed insight regarding both risk and resilience within the community.
Chapter 6. Discussion

Introduction

This chapter provides a summary of results findings, followed by recommendations for revision of the Nutrition Transition Questionnaire; biocultural theory as an interpretive lens; results findings in the context of the literature; theoretical gaps in the literature. It then elucidates a new emergent theory, Geo-Nomics theory, to address these gaps, based on evidence provided by this study. Lessons learned regarding cross-cultural research are also discussed. Public health research, practice and policy implications are considered, in addition to strengths and weaknesses of this study and its contributions to the literature.

Summary of Findings

Quantitative data analysis indicates that high cholesterol (n=32) and metabolic syndrome (n=7) were the chronic illnesses that had highest occurrence, of all diseases surveyed. Several had oral health problems, namely loose teeth (n= 22), problems chewing (n=26) and cavities (n= 62). Alpha correlation of risk scale items was .535; resilience items had an alpha of -.762; oral health items had an alpha of .575; while measured chronic disease items had an alpha of .454. Interestingly, all items in both the risk and resilience scales had significant inter-item correlations (p<.01), suggesting that although little response variability within resilience precluded effective alpha analysis, the item level measures included within the nutrition transition questionnaire to
assess the constructs of risk and resilience are nevertheless salient and cohesive within this research population.

Among the Kichwas, lifestyle risk behaviors include double carbohydrates at meals to stretch protein rations; household chores are considered sufficient exercise; fast food is preferred by city goers since they do not eat cold food. With respect to chronic disease, the majority of study participants were not affected. Interestingly, loose teeth and cavities are prevalent health issues, suggesting that access to oral health care is a concern among the Andean Kichwas. While men work in the city to earn a living for the family, food is a woman’s occupation. Women are the planters, farmers and cooks of the family, which signifies a considerable broadening of the western definition of nutritional gatekeeper, which focuses on grocery-shopping, meal planning and preparation. When they are home, husbands help their wives with all aspects of food planning, preparation, and shopping.

One of the most striking findings of this study is that the proximity between tree and plate mediates food choice. Participants who were fortunate enough to own fruit and vegetable gardens were proud of the convenience they enjoyed of walking outside to pick the produce needed for their daily menu. Food availability is the prevailing decision heuristic in this community where fruits and vegetables are a way of life. Given that everyone grows slightly different produce, the exchange of fruits and vegetables among friends and neighbors diversifies and enriches the family diet. Additionally, collective cultural practices such as bread making, planting and reaping of plants (potatoes, beans, corn) affects food choices, suggesting that the freshness of produce is also influential regarding dietary behavior at the individual and household levels.
The sample’s lack of access to modern transportation served as a protective lifestyle factor since they walked everywhere. While they do watch television during the weekdays, weekends are family time where television watching is limited. Few if any study participants indicated that their food choices are affected by advertisements on television. Urbanization affects primarily the men who commute to work in the city. Since they do not eat cold food, they are more likely to buy fast food for lunch.

The culture of having an herb garden, and raising various livestock (pigs, cows, Guinea pigs and chickens) has two functions- to feed the family and present an economic opportunity for woman sell food, fresh juices and fruits that they grow. The majority of food grown serves to feed the family and livestock stop. The distance between the tree and the plate influences the variety and quality of food.

**Public Health Perspectives on Findings**

Positive deviance focuses on identifying the protective health practices within a community that distinguish positive exceptions to the rule of detrimental health norms. The findings of this study extend this idea of resilience to community and environmental levels, and, makes a preliminary attempt to assemble these facets of ecological facilitators of resilience by proposing an emergent ecological model of Geo-Nomics, which will be discussed in subsequent sections. The Food Choice Process Model also influenced the scope of data analysis by focusing on decision-making rules and food preparation processes within the community. These findings are summarized in the table below.
Table 6.0 Positive Deviance and Food Choice Process Model applied to findings

<table>
<thead>
<tr>
<th>Positive deviance (PD)</th>
<th>Food Choice Process Model (FCPM)</th>
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<tbody>
<tr>
<td>Theory guiding data analysis process</td>
<td></td>
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<tr>
<td>Protective dietary practices at the individual and household level.</td>
<td>Food choice heuristics that govern how decisions were made about meal planning and preparation.</td>
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<tr>
<td>Application of theory to findings during data analysis</td>
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<tr>
<td>Understanding of the role of geology, climate, physical environment, culture, economics and ancestral Kichwas identity. These macrosystemic factors transcend the behavioral, interpersonal scope of PD theory.</td>
<td>Who makes decisions about food and where do they get their food from. Food values that include organic food free of genetically modified food are relevant to food choices and shows awareness of concerns regarding food sovereignty.</td>
</tr>
<tr>
<td>Examples of findings highlighted by theory</td>
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<tr>
<td>Ancestral identity and the Kichwas pride in their history helped to buffer them from the dietary westernization that ensues from desculturización (i.e., a loss of cultural identity).</td>
<td>Mothers cooks what there is, i.e. what they have available (“lo que hay”).</td>
</tr>
<tr>
<td>Access to biodiversity and per capita/household access to land to grow gardens and maintain a horticultural lifestyle facilitated regular household consumption of traditional meals.</td>
<td>Men play an active role in meal planning, cooking, cleaning and food shopping when they are home</td>
</tr>
<tr>
<td>Friends and neighbors exchange produce between households. This bio-economic exchange system facilitates income for women who sell fruits, juices and smoothies at small stands that they set up at bus stations, road sides, and at festivals.</td>
<td>Mothers cook what is healthy and nutrient dense for their children and families. They fortify soups such as masamora with a mixture of protein rich pea flours to compensate for the small portions of animal protein that are included in soups.</td>
</tr>
<tr>
<td>Access to biodiversity (domestic livestock and lush vegetation, herbs, fruits and medicinal plants) diversifies and fortifies the family diet by ensuring access to a wide range of nutrient from fresh produce.</td>
<td>Children enjoy fruits. Their fruit preference is part of a food choice trajectory that features introduction of fruits in infancy.</td>
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<td>Soups’ and fruits’ popularity is cultivated from infancy, thereby ensuring ancestral identity in dietary behavior from infancy. Soups also serve as an effective strategy to provide nutrient dense meals despite limited animal protein portions, since a variety of pea flours, beans, vegetables and herbs are used to make various soups. Soups also stretch limited resources among large families.</td>
<td>Utilizing the idea of food trajectories within FCPM, Children’s preference for traditional soups suggests that this food choice in childhood can provide a foundation for a healthy lifestyle as an adult, given that soups generally contain fresh vegetables.</td>
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Positive deviance focused the scope of analysis into the multiple layers of resilience within the Kichwas community which seem to buffer the impact of the nutrition transition. For example, the Kichwas people’s emphasis on active resistance to genetically modified and fumigated foods are one way in which they maintain food sovereignty and protect both the quality and diversity of their diet and horticultural way of life.

The importance of landscape, geology and biodiversity as ecological protectors of the traditional indigenous diet apply not only to the Kichwas of this study, but a number of other indigenous populations. Scholars refer to this concept as indigenous food and agro-ecological systems (Woodley et al., 2006). Examples include the Nuxalk of British Columbia, who command an impressively diverse terrain comprised of dense vegetation as well as rivers and streams that provide a wealth of seafood and fish (Turner et al., 2009); the Gwich’in of Canada whose food system is defined by their access to the land where porcupine caribou, their protein staple, roam (Kuhnlein, McDonald, et al., 2009); the Awajun of Peru, whose access to land and soil facilitates a horticultural lifestyle of polycultivation (similar to the Kichwas) in which they grow an array of crops that includes cassava, banana, peanuts, maize, cacao, sugar cane, rice, coffee, papaya, citric fruits, *achiote*, *pituca*, pineapple, *sacha*, *corvina*, *yahuarachi*, Hungarin ray, and *fasaco*, in addition to gathering wild fruits from palms, uvilla trees, sprouts of palms, stems, cortex and resins, with fish as their main animal protein (Creed-Kanashiro, Roche, Cerron, & Kuhnlein, 2009).

The commonality of the confluential, synergistic and resilience-promoting impact of various geological factors upon the diet of indigenous diets suggest the need for a coherent ecological theory and framework that focuses on these confluential synergies which promotes
indigenous lifestyle resilience to the nutrition transition, a salubrious consequence of the incredible biodiversity that delineates indigenous food systems globally.

The Food Choice Process Model (FCPM) was also helpful in illuminating intrapersonal and interpersonal dynamics within indigenous households regarding meal planning and preparation. The collective culture of the Kichwas in food preparation through *mingas* also serves as a vital component of horticulture and food cultivation, which in turn are related to food preferences and trajectories as theorized by FCPM. The importance of collective culture does not apply only to the horticultural Kichwas but to other indigenous populations, such as the Inuit (Egeland et al., 2009) who engage in similar food cultivation practices to equitably distribute freshly hunted meat across households.

**Anthropological Perspectives on Findings**

The following table summarizes the various anthropology theories that were applicable to findings of this study. The table provides an overview of syndemic theory and its mismatch with results, biocultural interactions, cultural consonance and ethnopharmacology. It first defines these classic terms as they are used in the literature then illustrates the way in which this term’s definition was in turn applied to study findings. It then provides specific examples of findings to which these theories were applied.
Table 6.1 Anthropological theories applied to findings

<table>
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<tr>
<td>Definition in this study</td>
<td>The ways in which synergistic social factors were related to chronic disease risk and comorbidities.</td>
<td>In this study refers to the ways in which biology and culture interact to produce health beliefs and behaviors related to food choices, preferences and customs in the community. It also includes the geocultural bases of food choices (Etkin, 2008) at the individual and household levels.</td>
</tr>
<tr>
<td>Application to findings</td>
<td>On account of the low rate of chronic disease comorbidities within this study, syndemic theory did not readily apply to this Kichwas indigenous population of this study.</td>
<td>Soups are popular among adults and children – they stretch resources to feed large households despite small portions of protein. Dogs protect children and facilitate their physical activity. Ahi is a popular and ubiquitous pepper sauce condiment that is akin to ketchup in the Kichwas culture.</td>
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</table>
Syndemic Theory applied to Study Findings

Singer (2017) indicates three essential components in the application of syndemics to a population: “a syndemics approach examines why certain diseases cluster (i.e. multiple diseases affecting individuals and groups); the pathways through which they interact biologically in individuals and within populations, and thereby multiple their overall disease burden, and the ways in which social environments, especially conditions of social inequality and injustice, contributing to disease clustering and interactions as well as to vulnerability (p. 941, Singer, 2017).” Among the Kichwas, quantitative data analysis of biometric data revealed a low occurrence of diabetes, as well as a low occurrence of comorbidities among other chronic conditions such as high cholesterol, heart disease. The only chronic condition that had a relatively high occurrence in the study sample was high cholesterol, which may be the result of the community’s regular consumption of, and belief in the healthy value of sunflower oil. Among this study sample, chronic diseases did not cluster in the manner theorized by syndemic theory, nor did the disease burden proliferate, thus, in hindsight syndemic theory seems less applicable and or relevant to the findings.

The Kichwas of this study also have access to biodiversity (large parcels of land with rich soil for horticulture) and natural resources (such a pure mountain water distributed via an underground well) that fortify and diversify the family and individual diet with nutrient dense produce grown from fertile soil that has remained largely untouched by pesticides, which were not reported by any of the people I encountered. This suggests that the protections offered by the geocultural ecosystem and ancestral identity of the Kichwas may in fact serve to offset or buffer the deleterious and insalubrious impacts of the socio-political vulnerabilities suffered by
displaced diaspora and marginalized populations such as the refugees and immigrants referred to in Mendenhall’s examples (Mendenhall, 2017).

**Biocultural Theory as an Interpretive Lens**

Interviews, ethnographic field work and participant observation all revealed that biocultural theory is a critical interpretive lens through which various lived experiences, stories, observations regarding the physical environment can create meaning. Biocultural theory was an invaluable resource in understanding and interpreting findings in the field, which in turn facilitated the development of an emergent theory that will be discussed in the discussion section of this study. Biocultural theory influenced the ways in which data were received and interpreted iteratively in the field, particularly during ethnographic research. For example, after observing the popularity of both cats and dogs as pets, it was raised as a question during ethnography, given the general poverty of agricultural Kichwas families and the fact that such pets required protein in an environment where meat was a scarce and highly valued commodity. It was revealed that both dogs and cats have a biocultural role as pets – dogs facilitate physical activity for children by accompanying them throughout the community while their parents work the land. Dogs therefore provide a sense of added safety for children. Additionally, they act as a natural alarm system should strangers venture near the family’s property.

By way of illustration, I found myself chased by more than one dog during my morning runs. They protected their territory fiercely and vociferously. One community member shared that family members keep several dogs because the more dogs they own, the safer they feel knowing that their property is well guarded. Several doors of houses did not appear to have strong locks, nor were front doors often locked. Given neighbors’ propensity to simply drop in unannounced, the biocultural value of dogs as pets became quite clear. Cats served a similar
albeit different role – their job was to protect the crops from rodents by hunting them. For this reason, it was not an uncommon practice to own several cats in each household. Given this biocultural role of pets, it makes sense that veterinarians were reserved mainly for livestock, which provided valuable milk and resources for the family. Dogs and cats were rarely if ever treated by a vet – they either survived or died when they became ill.

With respect to the nutrition transition, biocultural theory was a useful lens in filtering observations about the relationship between ecology, climate, geology, physical environment, economy and lifestyles. For example, although women do not set aside time to specifically exercise, many carry large loads of corn sheaves (as heavy as 50 to 100 pounds by appearance) upon their backs. They carry these burdens up to their homes from the fields where the corn is harvested, traversing steep slopes throughout the day. It was therefore no surprise that many of the women who did this work were well over 50 years of age – despite their small stature, they remained strong enough to do such intensive labor well into their old age. Those who did not carry burdens on their backs walked at least twice a day, taking their cows to eat at pastures. Cows were generally taken to pasture to eat early in the morning and walked back to the family home around 5pm every evening.

Another example of biocultural theory is that teenage boys often stayed up late at night during the summer vacation playing basketball in the community basketball court. Packs of village dogs congregated outside the court as the teens played. This likely explains why parents proceeded as usual, going to bed early without concern for their adolescents’ safety. The large number of boys, in addition to the large pack of village pet dogs that congregated at night (homes are rarely fenced and gated in this community due to the collective culture of the Kichwas) put
together using the lens of biocultural theory, made it understandable that parents allowed their sons to stay out late, given their trust in the safety of the village.

Thus, biocultural theory was useful in understanding that the labor intensive demands of daily chores provided both cardiovascular and weight bearing exercise for women throughout the community. It was understandable therefore that interview participants saw no need to set aside designated time for exercise, as is done in a western context where people work indoors and enjoy the convenience of vehicular transportation. In so doing, biocultural theory is a useful tool with respect to studying lifestyle risk and resilience, particularly those of interest in the context of the nutrition transition.

**Biocultural Interactions and Cultural Consonance applied to Findings**

While biocultural theory did not guide the conceptualization of the study, it was a useful framework that facilitated culturally relevant interpretation of findings. Biocultural theory was more applicable than syndemic theory in the interpretation of the data. Syndemic theory would have been more useful has there been comorbidity in the occurrence of chronic conditions, as is the case with the nutrition transition in general. This was not the case. Instead, cultural mechanisms were discovered through participant observation. These cultural mechanisms facilitate active resistance to dietary westernization (such as the tradition of soups and botanical medicine promoted by the Mama Pacha religion) and lifestyle resilience to the nutrition transition (such as in the case of dogs who protect children and facilitate physical activity). Biocultural theory was therefore more applicable to study findings than syndemic theory. When placed in the context of the wider literature, particularly the comprehensive indigenous food systems work conducted by Kuhnlein et. al (2009), it becomes clear that biocultural theory may have wider applicability to work with indigenous populations, given the
complex and multilayered role of the agro-ecosystem within indigenous cultures who subsist off
the land as either hunters, farmers, or some combination of the two.

The Kichwas practice the Mama Pacha religion, which syncretically blends
Catholicism with indigenous deities associated with nature, the sun and the earth. Kichwas
people describe Mama Pacha as a powerful spirit that watches over the earth and is the guardian
of the seasons. This belief system may have been influenced by the Inca deities or it may be a
syncretic blend of pre-existing Kichwas beliefs that blended with Inca spiritualism and, later,
with the Catholicism of the Spaniards. As with the Kichwas who practice botanical medicine as
an aspect as their syncretic Mama Pacha religion, plants, animals, and their ancient role as
guardians of nature present an integral aspect of indigenous spirituality among other tribes
throughout the world (Kuhnlein, Erasmus, et al., 2009; Woodley et al., 2006).

William Dressler, a biocultural medical anthropologist, posits two relevant concepts
in his examination of the complex interplay between culture and chronic disease risk: cultural
consonance (Dressler, 2012) and biocultural interactions (Dressler, 1995). This section will
discuss how these concepts can be applied to findings. Dressler relates the idea of biocultural
interaction to a larger concept of adaptation, as exemplified by Donnison’s work in East Africa
on cardiovascular disease.

Dressler defines adaptation as “the responses of populations to environmental
circumstances and the response of individuals within populations to the physical and social
stimuli to which they are exposed (p.33, Dressler, 1995).” Dressler goes on to explain that
cardiovascular risk in East Africa is the result of individuals and their communities responding to
shifting diets and lifestyles. This idea can be applied to resilience and protective behaviors
related to the traditional lifestyle of the Kichwas of this study. Just as biocultural interaction can
explain risk, it can also explain resilience. Additionally, in the context of their history in which the community elders came together to spread recipes and seeds, the need to maintain citrus intake may be one reason why the *Ahi* pepper condiment is ubiquitous in current Kichwas culinary culture. *Ahi*’s popularity may be viewed as evidence of biocultural interaction with an environment where citrus availability was not always a guarantee. Its popularity thus serves as an adaptive strategy to prevent vitamin deficiencies in order to preclude a repetition of a history of malnutrition.

Dressler (Dressler, 2012) defines cultural consonance as “the degree to which individuals approximate, in their own beliefs and behaviors, the prototypes for belief and behavior in shared cultural models. Cultural consonance links the cultural to the individual in terms of behavior (p.390, Dressler, 2012).” Dressler goes on to argue for the empirical application of culture within assessment through culturally consonant instruments developed through mixed methods similar to those implemented in this study. This study may be viewed as a preliminary foray to develop a culturally sensitive lifestyle assessment. In the context of Dressler’s work on cultural consonance and biocultural interaction (Dressler, 1995, 2005, 2012), the high intra-class correlation score of the yes/no item of “Do you eat a traditional diet of corn, soups, and potatoes?” (Corrected Item-Total Correlation=.354), when triangulated with the qualitative, ethnographic finding that soups are central to the horticultural Kichwas lifestyle, both in terms of adult household dietary behavior and child food preferences, together suggest that soups could represent a measure of cultural consonance within the horticultural Kichwas who reside in the towns of Turuku, Santa Barbara, Morochos and environs and identify themselves as Otavalo Kichwas. These ethnographic findings, obtained through in-depth interviews, key informant interviews, informal intercept interviews and participant observation suggest that ethnographic methodology can be
useful to public health research professionals who wish to create sustainable interventions by extrapolating pre-existing protective beliefs and behaviors to others within the community.

According to Dressler, “culture meaning systems will determine what is important within a system of social interaction…even when ethnography has informed measurement, the profound influence of meaning on thought and behavior, and even physiology, is like to lead to local-level variations in process” (p.53, Dressler, 1995). Local-level variations include the variations in child food preferences. While interviewees indicated that children enjoy soups, and ethnographic work corroborates that they additionally enjoy fruits and vegetables, other interviewees also expressed that children like pasta soup and fast food. Urged on by the work of Dressler, the need to flexibly accommodate to systems of meaning within a larger ecological context is one reason why Geo-Nomics as a suggested emergent theory arose from the data. It aims to provide a preliminary lens for future exploration and development, one which amalgamates the wide array of geographical and ecological influences (biodiversity, soil quality, water potability, climate, landscape, altitude) along with cultural, historical and economic synergies that together delineate the health beliefs and behaviors which trace the path from earth to plate in the plate earth proximity concept formulated by findings of this study. Dressler also issues a challenge: “how can cross-cultural comparability be achieved without sacrificing intracultural sensitivity in measurement?” (p.53, Dressler, 1995). The NTQ’s items, which contain individual and household level lifestyle behaviors, may thus be considered preliminary first steps towards addressing this challenge through the creation and application of a mixed methods approach to lifestyle risk and resilience assessment regarding chronic disease susceptibility and protection.

Dressler’s ideas about cultural consonance and biocultural interactions, when placed in the context of the nutrition transition, are amenable to incorporating pathways of both risk and
resilience within lifestyle assessment. These findings, in addition to its application to chronic disease risk in other populations, suggest the need for a new emergent theory. This new model can incorporate Dressler’s ideas in the context of the biodiversity and ecosystems with which indigenous populations interact in a world increasingly affected by the shift from subsistence to market economies and its consequent socio-cultural ramifications (urbanization, globalization, westernization, and desculturización/loss of cultural identity (Chee et al., 2017; Chee et al., 2018; Chee et al., 2016)).

**Soups and fruit preferences are culturally learned and reinforced.** Soups are popular among adults and children – they stretch resources to feed large households despite small portions of protein. Bioculturally, the popularity of soups may be seen as the Kichwas people responding to the assets of their environment creatively, to promote nutrient dense behavior and food trajectories despite their limitations in income and animal protein consumption. The trajectories concept discussed in the food choice process model is evident in the promotion of fruit consumption among children from a young age – I vividly recall seeing infants, toddlers, and young children eating and sharing fruits among siblings. In another instance, one interviewee mother multitasked while she spoke with the interview team (myself and two nurses), peeling an apple to share among her children and another to share with us. Fieldhouse asserts that the trajectory of food preference development is shaped by biocultural, biosocial processes (Fieldhouse, 2013). Furthermore, “…tastes can be acquired and …that likes and dislikes are products of cultural learning. As they are learned, they confer acceptability on regularly consumed foods which leads to long-term preferences for familiar items” (p.224, Fieldhouse, 2013).
To further explain this Kichwas practice of fruit popularization among children from infancy, Fieldhouse’s reference to the literature (Jerome, 1977) is relevant: “Jerome (1977) points out that in many cultures, sweet foods are offered to infants and young children. Thus the role of culture is to increase availability and amplify the basic biological preference for sweetness.” In light of this assertion, the introduction of fruits to infants children within the Kichwas culture appears to be a biosocial, culturally reinforced capitalization of our innate physiological preferences for sweet (Fieldhouse, 2013), which in turn promotes receptivity to, and, later on, a preference for fruits above artificially sweetened treats. In so doing, protective food preferences are cultivated early during the lifespan among the horticultural Kichwas to inculcate and propagate the cultural value in which fruits and vegetables are a way of life and should thus be included in every meal.

Ahi (also referred to as ahi de piedra) is a popular and ubiquitous pepper sauce condiment that is akin to ketchup in the Kichwas culture. It is served with any and every dish and serves as a gravy and salad dressing for beans, vegetables, potatoes and rice. It increases vitamin C intake in a community that once battled malnutrition on account of the lack of citrus. It pairs well with traditional foods and thus facilitates maintenance of Kichwas food culture and identity. This discussion of ahi in relation to biocultural theory draws on work from Fieldhouse (Fieldhouse, 2013), Rozin (Rozin, 1982), Pangborn (Pangborn, 1975) and Etkin (Etkin, 1988, 1993, 2008, 2017), regarding first the cultural promotion of ahi as an acquired taste preference similar to fruits discussed above (Fieldhouse, 2013), and secondly as a biocultural and historically rooted food choice with established ethnopharmacological benefits (Etkin, 2008). Fieldhouse’s synthesis of chili taste acquisition and preference shaping is relevant to
understanding the possible reasons regarding ahi’s popularity as a condiment among the Kichwas people of the Andes:

“Initial forced exposure to chili is followed by social reinforcement, which, combined with flavor enhancement gives rise to a real preference. Rozin also speculates on the operation of an ‘emotional homeostasis’ system; the unpleasant taste of chili is countered by an opposing affect reaction which gives rise to a pleasant internal sensation. With repeated exposures, this pleasurable opponent becomes dominant and thus chili becomes liked. An explanation which invokes beneficial effects as a rationale of consumption is offered by Pangborn (1975) who speculates that the widespread use of hot spicy foods is related to their bacteriostatic properties.”

The taste acquisition process of ahi among the Kichwas thus appears to hold a striking similarity to the value of chilis and spices as ingredients in tropical cuisine, which also serves as an anti-microbial prevention and treatment mechanism to in response to various food-illnesses (Etkin, 2008; Fieldhouse, 2013; Sherman & Flaxman, 2001; Sherman & Hash, 2001).

**Instrument Revision and Future Research**

One recurring issue that was encountered during administration of the nutrition transition questionnaire was the homogeneity of the sample - in other words, resilient questions elicited nearly the same response in almost everyone. In order to facilitate future instrument testing and validation, it is therefore recommended that steps be taken during the recruitment and administration Strands to survey a more heterogeneous sample consisting of people who live in both urban and rural lifestyles. This may in turn require surveying a greater geographic region to ensure a more diverse sample population.

Additional future recommendations are that each instrument should focus on one level of analysis: individual adult, child, household. It is difficult to create an instrument that encapsulates all 3 levels. Furthermore, when one is an outsider to the community in question, it is absolutely essential to involve local community members and stakeholders to ensure the
highest possible community buy-in to the research study. Language barriers and the consequent cultural implications of such differences should also be carefully considered when conducting future cross-cultural lifestyle assessment research.

It is also recommended that different versions of the assessment instrument be created, depending upon the purpose for which it is being administered and who is doing the administration. For example, the dietary and lifestyle behavior information that is most useful to a physician treating a patient who is at high risk of chronic disease is fairly different from the dietary trends and lifestyle patterns that would be of interest to a community-based public health researcher who wishes design a culturally appropriate health intervention. For this reason, a revised version of the Nutrition Transition Questionnaire instrument has been included in Appendix L. This revised version is based both on current study findings and emergent literature regarding healthy lifestyles. The revision also makes allowances for adapted versions, depending on who is administering the survey (physicians/nutritionists versus public health researchers). Allowances have also been made with the setting of the research site, be it Western/developed/within the United States versus international/less developed countries. It should also be noted that future research among the Kichwas can utilize the questions which made it to the final analysis as a succinct and culturally relevant tool.

**Lifestyle Trends among the Kichwas of this Study compared to the Literature**

Common lifestyle risk factors among indigenous communities include physical inactivity, smoking, obesity, and non-traditional diets dominated by fatty, sugary and processed foods (Canada, 2011; Harris, Tompkins, & TeHiwi, 2017). Among this sample, lifestyle risk behaviors include double carbohydrates at meals, a lack of attention to exercise with household chores constituting the majority of physical activity, and fast food consumption for city-goers. Given the
labor-intensive nature of the agricultural lifestyle of the Kichwas of this study, physical inactivity is not a large health concern within this community. This finding means that the combination of their traditional diet, together with a lifestyle that features walking steep slopes daily in the process of daily chores (such as taking cows to pasture in the morning and walking them home in the evening), means that despite the risk factors observed, this community is largely protected from the nutrition transition.

Furthermore, literature that surveys the health needs and concerns of indigenous peoples indicates that, due to the colonization, they have suffered a host of infectious and chronic diseases (Gracey & King, 2009). Measured rates of chronic disease in this study were found to affect less than half the sample size, with few cases of diabetes and higher occurrence of high cholesterol, obesity, overweight and high blood pressure. Self-reported rates of chronic disease was much lower, suggesting a discrepancy between actual occurrence and perceived susceptibility. Nevertheless, given that less than half the sample was affected by high cholesterol and hypertension, with less than five cases of diabetes, there exists the possibility that there exist both risk and protective factors at work within this population regarding chronic illness. With respect to oral health, in comparison to the occurrence of dental caries among other indigenous peoples (Gracey & King, 2009), findings of this study align with oral health care concerns reported among other indigenous groups such as the Kiriri indigenous people of Brazil (Ribeiro et al., 2016).

With respect to gender roles, culinary traditions and their influence upon dietary behavior, this study revealed several key insights. Food is a woman’s work – while men assist with food shopping and meal planning when they are home, men’s primary role is that of primary breadwinner and provider for the family. While men go out to work, food constitutes the
primary responsibility and task of women who are the nutritional gatekeepers of the family. They sow, reap, dry, and sift the crops, plan the majority of meals and cook food for the family each day. Women also reported that culinary traditions were generally passed from one generation to another, an aspect of their indigenous identity and family bonding that appeared to apply to most if not all participants. There is currently a paucity in the literature, which does not address the matter of gender roles, culinary traditions and how this heritage influences food choices.

Regarding beliefs, traditions, and health practices that affect household dietary patterns and food choice processes, ethnographic participant observation revealed that for several families lucky enough to have a home garden, the proximity between the tree/farm and the plate appears to mediate food choices. Community members and interviewees indicated that they also believed that this distance plays a critical role in the addition of chemicals to their food. When participants were asked what drives their meal planning, many simply said – “What there is” – this indicates that food availability is the prevailing food decision heuristic in this population. Additional findings were that fruits and vegetables are a way of life; a bio-economic system of exchange of fruits and vegetables among friends and neighbors diversifies and enriches the family diet; meal planning is based on necessity and availability. Additionally, the collective culture and practices such as bread making, planting and reaping of plants (potatoes, beans, corn) affects food choices. Similar to the findings of other studies (Valeggia, Burke, & Fernandez-Duque, 2010), women in this study appeared to eat a healthier diet than men. Women primarily cooked and ate traditional food while men who commuted to the city ate fast food – they do not pack lunch because the Kichwas do not eat cold food. Similarly, researchers indicate that Toba women ate less marketed food and more foraged food (Valeggia et al., 2010).
With respect to urbanization and globalization’s influence upon dietary behavior, the sample’s lack of access to technology and modern transportation served as protective lifestyle factors since they walked everywhere. Urbanization affects primarily the men who commute to work in the city. Since they do not eat cold food, they are more likely to buy fast food for lunch. Scholars refer to a phenomenon known as residential instability, which refers to the disruption of social cohesion within families as a consequence of frequent commutes to work in the city (King, Smith, & Gracey, 2009). Additionally, this instability often results in low-income single mother households (King et al., 2009). While this issue affects a number of indigenous communities (King et al., 2009), this concern was not reported by participants of this study. Instead, while men did commute long distances to work, several wives shared during interviews that their husbands assist them with cooking, shopping and meal planning.

Regarding protective health beliefs and behaviors, fruit and vegetable gardens as well as livestock rearing (cows, chickens, pigs, guinea pigs) served as a protective factor. Most families grew their own food and so were able to maintain a diet of fresh fruits and vegetables. Safety of the physical environment in the countryside meant that children roam freely and get physical activity during both day (for the younger children who play in fields and parks) and night (particularly adolescent boys who play basketball late into the evenings). These ethnographic observations regarding the safety of the physical environment are in keeping with findings of the literature, which reports that the majority of indigenous people feel safe during both day and night in their physical environment (Macniven et al., 2016).

**Indigenous health findings.** Given their agricultural way of life and low measured rates of diabetes, the people of this study may be at the early stages of the nutrition transition. Infectious diseases are not a great health concern. Findings of this study are different from the
majority of indigenous health scholarship that has focused on the increased risk of chronic
disease as a result of market integration and consequent dietary westernization (Damman, Eide,
& Kuhnlein, 2008; Kuhnlein, 2000, 2003; Kuhnlein et al., 2006; Kuhnlein, Erasmus, et al., 2009;
Kuhnlein & Receveur, 1996, 2007; Kuhnlein, Receveur, Soueida, & Egeland, 2004; Port
Lourenço, Ventura Santos, Orellana, & Coimbra, 2008; Shetty, 2002; Waqa & Mavoa, 2006;
Welch et al., 2009; Willows, 2005).

The people of this study, unlike those of these cited works, engage in specific protective
behaviors that comprises resilience of several households to chronic disease: 1) They maintain
their traditional diet that consists largely of soups, ancient grains and vegetables; 2) Home-made
meals are the mainstay of their lifestyle; 3) Fresh produce is a way of life for all, particularly
those fortunate enough to own home gardens; 4) Their distance from cities, together with the
high altitude, steep slopes and lack of transportation and conveniences such as washing
machines, prevents sedentary lifestyles; 5) The freshness of produce and availability thereof are
the prevailing food choice heuristics.

These beliefs and behaviors, together with the importance of their cultural identity, as
opposed to identity loss experienced by other peoples (Kuhnlein et al., 2006), signifies that the
agricultural Andean Kichwas live out their traditions in a manner which lowers their collective
vulnerability to chronic disease.

**Critique of the Nutrition Transition**

Popkin (Popkin et.al, 2012) indicates that the rate of food system changes that increase
dietary westernization are not happening at the same rate in different countries. Furthermore,
Popkin (Popkin et.al, 2012) also adds that there is currently insufficient evidence that documents
the nuances of these changes and differences between countries. Additional research on other
indigenous populations indicates that indigenous peoples experience the nutrition transition in different ways. The below table, contributed by Kuhlein and associates, illustrates the percentage of adult dietary energy derived from traditional foods, as well as the number of plant species that provide these traditional food sources (Kuhnlein, Erasmus, et al., 2009). This table reveals critical insight regarding: 1) The different rates of dietary westernization among various indigenous peoples; 2) The tremendous diversity across food systems that sustain their traditional diet; 3) The nutrition transition, along with the associated phenomena of dietary westernization and a loss of traditional diet, may best be framed as a occurring on a broad spectrum, particularly with respect to indigenous populations.

If the number of plant food sources and the percentage of adult dietary energy coming from traditional foods may be considered proxy measures of the nutrition transition among indigenous populations, then the multilayered complexities of dietary shifts and westernization become quite clear. For example, the Awajun of Peru have maintained their traditional diet, with 93% of adult dietary energy coming from 223 plant species within their food system. Similarly, the Igbo of Nigeria have also maintained a strong traditional diet, with 96% of their daily energy intake coming from 220 plant species. By contrast, the Maasai of Kenya are at the opposite end of the spectrum, with only 6% of dietary energy coming from a mere 35 plant species. In the middle of the spectrum are the Inuit and Ingano, with adult dietary energy ranging between 41-47% from between 79-160 food sources respectively. An interesting nuance is that the Dalit of India, consume only 43% from traditional foods, despite having as many as 329 plant species food sources. Other nuances are that although the Dalit, Pohnpei and Karen all have more than 300 plant food sources, they are each located in different parts of the nutrition transition spectrum depicted below, with the Pohnpei at one end consuming the least traditional food daily
at 27% (an indication of dietary westernization), the Dalit in the middle at 43%, and the Karen at the healthiest end, consuming 85% of their daily food from traditional foods.

**Cultural Resistance and the Spectrum of The Indigenous Nutrition Transition**

Popkin (Popkin, Adair, & Ng, 2012) also indicates that the global decrease in consumption of protective foods (legumes, vegetables, and coarse grains) increases chronic disease susceptibility. By contrast, the Kichwas traditional diet continues to incorporate these protective foods in nutrient dense soups and various traditional dishes. Daily consumption of traditional home-made meals, a mark of cultural pride, serves to protect the community from this susceptibility. Furthermore, this conscious choice to maintain their ancestral diet suggests that cultural resistance to dietary westernization is somewhat protective against chronic illness, as indicated by the low rate of diabetes in the sample.

Figure 6.0 illustrates Popkin’s point that while the nutrition transition broadly encompasses specific population level dietary shifts, the cross-cultural nuances of this global transition are not as easily conceptualized (Popkin et.al, 2012). Data sources may be one reason that this complication exists, since Popkin’s data consists largely of a variety of quantitative indicators related to health economics. Thus, it may be argued that qualitative, ethnographic data, such as that furnished by the methodology of this study, may play a useful role in addressing existing gaps in knowledge regarding the nutrition transition.
Findings from this study (Kuhnlein, Erasmus, et al., 2009) corroborate Popkin’s caveat (Popkin et al., 2012) and the wider literature discussed above - the nutrition transition is by no means a simple, standard process across global indigenous populations. The Kichwas in this study, for example, shared that they actively resist dietary westernization by eating ancestral grains such as quinoa, beans such as *chuchuca*, *choclo* (i.e. corn), and a variety of soups that constitute the foundation of their diet and a means of stretching resources. Even the children “prefer soups and grains” because “it is healthy”. Children also prefer fruits over western snacks – in one town, three of the four households interviewed had children sharing fruit whereas only one household had children snacking on western processed food. Another way in which they resist dietary westernization is the low frequency of soda consumption.
High Cholesterol and the Nutrition Transition

Researchers (Popkin et al., 2012) suggest that one aspect of the nutrition transition is the global increase of plant oil consumption has led to an imbalance in ratio between omega 6 to 3 in fatty acids. Sunflower oil and margarine, which is widely available in both rural and urban stores, is the main cooking oil used. This infiltration of a western, highly processed plant oil carries with it an ominous implication that, although the horticultural Kichwas of this study remain fairly insulated from dietary westernization on account of the strong indigenous culinary identity, they are not, however, altogether immune from the insalubrious effects of market penetration.

Indigenous food choice factors in this study versus the literature. Traditional food culture represented a strong component of individual and household dietary behavior in this dissertation. This traditional food culture may be seen as comprising two broad areas: 1) Culture pertaining to intergenerational and community culinary and food gathering/hunting traditions; 2) Culture regarding traditional worldviews that encompass the earth, the family, individuals and daily dietary activity that respects the land. With respect to intergenerational and community traditions, social networks represented an integral aspect of agriculture among the Kichwas of this study. Similarly, social capital is also entwined with quality of life for the Inuit, who share hunting, harvesting and food preparation tasks as a community (Egeland et al., 2009). In this way, the Inuit’s collective hunting and food sharing activities parallel that of the Kichwas in this study, who host mingas to facilitate various aspects of agriculture and food preparation. Comparatively, the Karen of Thailand, for whom rice is a traditional staple that they grow, sharing of this resource is also an integral aspect of their community traditions (Chotiboriboon et al., 2009).
Regarding the indigenous worldview that respects the land through prudent hunting and farming (Kuhnlein, Erasmus, et al., 2009), the Kichwas also appear to ascribe to this belief system through their careful tending of various fields that produce corn, beans, potatoes and other produce. While this value was not verbally stated, their clear pride in showing off their huertos was enough to create a bond with me, an outsider, as they took me for tours through their home gardens. In examining the literature, pride in the land is an aspect of indigenous identity that cannot be underestimated. In a conference focusing on matters related to indigenous food sovereignty, scholars captured the essence of what I observed in my ethnographic field work among the Kichwas. Woodley et.al (p.2, 2006) share the following quote that expresses the sentiments I felt during my ethnography: “The death of a traditional food system is the death of a nation…physically and culturally. We can and must protect and restore practices that can make us healthy and well as indigenous people.” In this context of food sovereignty, the passing down of culinary skills from mother to daughter (such as soup-making and sifting dried beans from corn) among the Kichwas appears to be one way in which they maintain their traditional indigenous food culture and identity. Another quote from the literature “We would rather become extinct that lose our traditional food sources.” (p.2, Woodley et.al, 2006) also explains the signs I observed at organic farmers’ markets that read “No transgenicos”, indicating their active resistance to genetically modified foods and market integration that threatens their traditional food sovereignty and quality of fresh produce.

Landscape and geographic ecology were very influential factors related to individual and household food choices. The Kichwas subsistence activities of this study were also related to their access to land in which they could grow gardens and tend fields. As indicated elsewhere in the indigenous literature (Kuhnlein, Erasmus, et al., 2009), food quality, accessibility and
availability among the Kichwas of this dissertation appeared to be greatly influenced by their geographic altitude, climate, soil quality and the landscape which surrounded them. For example, towns such as Morochos that were at higher altitudes suffered colder climates and could not grow their own citrus, nor were they easily accessible to fruit trucks that traverse the area due to poor road access a factor which researchers have acknowledged to be influential upon indigenous food systems (Liebert et al., 2013). Soil quality also played a critical role in food quality and availability. One woman on a bus shared with me that the soil is so rich that its nutrients filter into the fruits and the livestock that the people eat.

Furthermore, it is also likely that water potability is an influential factor related to quality of life, food and horticultural harvests that the Andean Kichwas enjoy. The mountain stream water that is distributed via an underground well system and water trucks to remote areas at higher altitude, along with the lack of vehicular traffic, together serve to protect the soil from pollution while ensuring it remains a rich source of sustenance for plant life. I vividly remember one family was quite excited to tell me about their water that came from the mountain tops. After showing me that they avidly drink the water directly from the pipes without worrying about water potability, they happily filled the water bottles that the nurses and I carried with us. From that day onwards I stopped buying water – following the example of my host family, who did not filter water, nor did they buy it because they were aware of the high quality of their mountain water. My host mother once described this underground well to me quite proudly, showing her awareness of the water’s purity. Given the importance of these factors related to landscape and the agro-ecosystem which ensconce the food pathways indigenous peoples (Johnston, Fanzo, & Cogill, 2014b; Kuhnlein, Erasmus, et al., 2009; Liebert et al., 2013; Woodley et al., 2006), findings of this dissertation elucidate the need for an emergent theory which assembles these
ecological constructs and includes factors related to culture, intra and inter personal food choice dynamics (Sinley & Albrecht, 2016), economy, globalization, urbanization and westernization for future development and exploration. This diverse array of food choice influences would be particularly applicable to indigenous peoples, given the unique nature of their food system in relation to culture, nature, history and shifting economies.

Gaps in the Literature

This section overviews gaps in the literature, particularly as it relates to the theories which guided the conceptualization of this dissertation: Syndemic theory, positive deviance, and the food choice process model. These gaps form the basis of an argument for the development and application of a new, emergent, evidence-based theory that was guided by study findings and addresses existing deficits in current theoretical scholarship.

Syndemic theory gaps. Developed in the USA by Merill Singer, (Singer, 1994) syndemic theory, while useful in understanding pathological pathways that increase comorbidities, means that the theory cannot be as easily extrapolated to international settings. Additionally, syndemic theory focuses upon illness, in keeping with the tenets of social epidemiology. Thus, it does not fully explore the rich constellation of existing intrapersonal, cultural, ecological and historical influences with the purpose of explaining the cognitive, affective, behavioral and socio-cultural factors that eventually culminate in beliefs and behaviors that are antecedent to health outcomes of interest. Rather, syndemic theory focuses primarily on illness rather than the complete picture of beliefs and behaviors together with disease. This limitation signifies that syndemic theory is not as useful as a tool to illuminate the beliefs and behaviors within specific, international audience segments that can be used to design intervention, health education and health policies. The geographical diversity of foreign settings
and the accompanying ecological influences that require examination do not fall comprehensively within the scope of syndemic theory.

By way of example, while syndemics may explain immigrant health issues (Mendenhall, 2016), it is less useful as a tool to explore the health beliefs and behaviors of indigenous populations and other culturally unique groups within their natural historical environment since the focus of this lens, even applied in a global context, focuses upon disease synergies (Singer, Herring, Littleton, & Rock, 2011). While the political economy of health within syndemics can explain why immigrants have poor access to health care in the United States (Mendenhall, 2016), it may not as easily explain the beliefs and behaviors that lead to disease outcomes in a given population. Thus a considerable gap in this theory is that its focus is primarily on risk pathways. It neglects to encompass resilience, protective influences that create positive deviance, as well as intrapersonal, cultural and ecological factors that influence beliefs, behaviors and traditions that impact health. While few scholars have pointed out this gap in syndemics, researchers do acknowledge that comprehensive, multi-level interventions are required to affect the salient health outcomes that affect various at-risk groups (Gilbert et al., 2015).

Positive deviance gaps. While positive deviance uses ethnography to investigate hidden keys of to protective beliefs, behaviors and traditions, in the context of this study, it does not sufficiently outline the scope of focus that was necessary to comprehensively examine the complex array of influences that affect food choices among the Andean Kichwas people. For example, PD as a theory fails to consider ecological factors that may contribute to protective behaviors. The high slopes of the Andes, together with the intensive manual labor of daily life, means that women in particular live in a naturally protective environment - their lack of transportation and the heavy loads they carry constitutes daily cardiovascular exercise that
includes weight resistance. It was therefore no surprise that obesity did not appear to be a health concern in this community. Pets protect children as they play throughout the community, either in neighboring corn fields or walking cows to pasture. Thus, while PD was useful in highlighting the need for ethnography to identify protective behaviors, its scope is somewhat limited regarding the diversity of bio-cultural influences of resilience in this community.

**Food choice process model (FCPM) gaps.** FCPM, like syndemics, was developed in the United States. FCPM has been used entirely in application with western audiences (Falk et al., 1996; Furst et al., 1996). As such, the factors which affect food choices, as indicated by this model, do not encompass the socio-cultural, ecological, historical, interpersonal and economic factors that influence food choices in the agricultural Andean Kichwas community of this study.

**Need for an emergent theory.** Given the gaps in existing theories, findings of this study build and argument for the development of a new evidence-based theory, developed in an international setting, that extends the scope of syndemics to incorporate beliefs, behavior, interpersonal, ecological and socio-cultural factors. Indigenous health researchers indicate the need for inter-disciplinary interventions which incorporate: 1) Indigenous belief and value systems; 2) The social mechanisms related to their health outcomes; 3) The cultural determinants of beliefs, behavior, and disease (Burgess, Johnston, Bowman, & Whitehead, 2005). Interventionists would thus benefit greatly from a culturally sensitive theory that can facilitate systematic assessment thereof. A new theory is needed, one that encompasses the rich plethora of multi-level influences that culminated in the lifestyles observed among the Kichwas people.

While it can be applied to other topic areas in the future, as an emergent, evidence-based theory, geo-nomics in this study refers to the conglomerate and synergistic effects of several types of factors upon nutrition trends within the Kichwas community. This constellation of
entwined, synergistic factors include agricultural, trade, geographic, ecological, bio cultural, social, historical, psychological, traditional, and interpersonal. It should be noted that while syndemic theory focuses mainly on risk pathways for disease (Mendenhall, 2016; Singer, 1994), this emergent theory, shaped by the confluence of both syndemics and positive deviance, examines both risk as well as resilience pathways that explain the biocultural and behavioral roots of behaviors that lead to specific health behaviors, beliefs, which in turn give way the detrimental health outcomes (or corresponding positive deviance) in a given context.

**Emergent Theory of the Geo-Nomics of the Nutrition Transition**

**Introduction to preliminary Geo-Nomics Theory and Framework.** For the purposes of the nutrition transition, the levels of analysis of the emergent theory that was named Geo-nomics (distinct from the similar term genomics) are highlighted below. It is noteworthy that the “nomics” piece of this concept refers to a constellation of synergistic factors that, previously, have not been united under any umbrella term such as this; such socio-economic factors include employment, urbanization, globalization, westernization and access to technology and transportation.

As an emergent, evidence-based theory, Geo-Nomics seeks to explain, explore and describe specific patterns that can be observed at individual, community and global levels regarding dietary behavior and fruit and vegetable consumption. As an emergent theory, it has been influenced by positive deviance, concepts related to risk, resilience, health behaviors, health beliefs, bio cultural theory, the political economy of health, and most overtly, syndemic theory. The levels of analysis in this emerged theory include the following:

Geo-Nomics incorporates synergistic influences that lead to behavioral patterns and eventually lead to health outcomes. While the health outcome of interest in this study is lifestyles
(diet and physical activity), the theory can be applied to explore the beliefs and behaviors that culminate in other health outcomes of interest. Geology (location, altitude, slope, seasons, sunshine, rain, temperatures, and other factors which influence agricultural practices) + Ecology (climate, soil, fertility, plant symbiosis, pests, predators and rodents) + Economics (urbanization, globalization, westernization, access and utilization of technology, transportation, employment patterns, migration and immigration).

Agrigeonomics encompasses agricultural and horticultural trade, geographical and ecological assets, resources, deficits and system and the resulting contextual economies that adapt and evolve over time to create patterns of fruit and vegetable consumption.

Sociogeonomics encompasses the cultural historical traditional now and interpersonal beliefs behaviors and practices within the community that both shape and are impacted by geographical and ecological resources deficits and assets and consequent economic system. These synergistic factors conglomerate the affect health behaviors which include food choices, family diet and physical activity.

While agrigeonomics considers macro level systems and factors which influence community level patterns of fruit and vegetable consumption, nutrigeonomics considers the constellation of factors and journeys that eventually lead to individual level food choice patterns, summarized here by the concept of the plate (i.e. its contents, quality and proportions). Understanding this concept inherently involves understanding of the most relevant and salient factors at play with in the other levels of analysis within this theory. Key ideas related to this concept include the person, place, and their plate.

While Nutrigeonomics is specifically focused upon the constellation of influences that lead to the plate, this concept is a psychosocial one, and thus can be applied to other topic areas
in the future. For the purposes of the nutrition transition, it refers to intrapersonal factors such as personality, personal preferences, emotional regulation and gratification mechanisms that are in constant interaction with and therefore impacted by contextual influences such as those highlighted above, particularly the ecosystem of bio cultural, ecological, social, geographical, economic and, if applicable, agricultural influences which together over time create specific food choice heuristic that very between cultures and communities in response to environmental influences.

It should be noted that these planes may change as future research is conducted to further delineate the applicability of the Geo-Nomics theory and framework. This emergent theory arose out of findings from this mixed methods study. This etiology signifies that this geocultural perspective of the ecosystem that shapes, propels, sustains and reinforces lifestyle behaviors (diet and physical activity) is particularly suited for use with indigenous populations, whose quotidian interaction with biodiversity and environs presents an intriguing fact of resilience that warrants future investigation. The idea of Geo-Nomics also sprung from the ethnographic finding of this study that, although they suffer marginalization and isolation, indigenous peoples may be extinguished from other at-risk populations by virtue of the ancestral identity that, for some groups such as the Kichwas, spans hundreds of years.

**Geo-Nomics applied to this Study**

The constellation of ecological, cultural and individual factors worked together to explain individual and household dietary behavior and patterns of physical activity. For example, soups are a regular part of the diet as a way of stretching food and feeding many people with available crops and limited portions of animal protein. This is also why families tend to double carbohydrates at meal time (example pasta and rice, rice and corn, or rice and potatoes) and limit
their servings of protein. However, the richness of the soil, abundant biodiversity, and wide variety of available fruits and vegetables (which absorb all the vitamins and minerals from the soil) sufficiently compensate for this practice. Thus the geocultural assets of the Kichwas food system serve to prevent malnutrition by fostering a lifestyle punctuated by fruit and vegetables blended into daily meal recipes, rituals and traditions.

Additionally, many families raise domestic livestock that includes cows, chickens and or pigs - thereby ensuring regular access to meat, albeit not plentiful. Cows and pigs in particular are raised by households with access to land in which to keep them and serve primarily as a form of income (pigs are fattened then eventually sold to butchers while grass-fed, hormone free cow milk is consumed by the family and sold to neighbors). Thus, household and per capita access to land for raising domestic livestock and soil for growing gardens and crops present one way in which the household benefitted from access to biodiversity on account of geological factors such as soil quality, water potability, climate and the mountainous landscape.

Protein is affordable by American standards, but wages are so low that buying protein in sufficient quantities to feed a large family can become quite challenging. Some families make as little as $1200 a month with a government job. In the market, 3 chickens can be purchased for $20. 1 pound of trout costs $12, one fish for $6, and the grocery. Thus, the cultural popularity of soups among adults as a tradition and children as a familiar favorite serves an important biocultural mechanism – to stretch limited resources in order to feed multi-generational families, many of whom have at least three children in households of four to six people.
Potential Contributions of Geo-Nomics to the Literature

While Geo-Nomics as a theory contains concepts similar to those found within the social determinants of health, syndemic theory, the political economy of health and bio cultural theory, it remains distinct in that it is used to explore the conglomerate effects of a complex bio-economic ecosystem that can explain and describe behavior patterns related to individual and household lifestyles within the community. These patterns incorporate both protective and risky health beliefs and behaviors.

In Figure 6.2 below, the Geo-Nomics conceptual framework has been applied to ethnographic findings of this study among the Kichwas. Key emergent terms in this framework are: 1) Geo-Nomics: an emergent, preliminary conceptual and analytic framework that encompasses the geocultural ecosystem which shapes lifestyle patterns at the individual, household and community levels; 2) Resilience inventory: This refers to the specific ways in which the Geo-Nomics components (geology, horticulture, ecology, economics, culture and tradition) manifest in quotidian activities and more general way of life practiced at the individual, interpersonal, and community levels; 3) Earth-Plate proximity: This finding was the most concrete and palpable of these three proposed terms. It refers to the distance between one’s food source and one’s plate, and also extends to the household level of the proximal or distal distance be family’s general food sources and their daily menu. Households with proximal earth-plate proximity enjoyed access to home gardens while families with distal earth-plate proximity lived at higher altitudes, at colder climate untenable for growing citrus, and often in more rural areas with limited road access, a factor which scholars acknowledge as critical in delineating indigenous food systems.
These preliminary Geo-Nomic constructs, illustrated below, can be applied to indigenous work in an asset-focused or strength-based understanding of the multilayered complexities of risk and resilience offered by access to rich biodiversity and the array of macrosystemic factors which delineate the path from earth to plate. Understanding the biocultural roots of biosocial health beliefs and behaviors such as those related to food choice can establish a foundation for sustainable health interventions by capitalizing upon pre-existing cultural strengths. This emergent theory is particularly suited to indigenous populations, many of whom enjoy an ancestral history that is hundreds of years old, and, in the case of the Kichwas, predates the Inca empire. Figure 6.1 illustrates the interrelated synergies that unite geocultural, climatological, ecological, and economic confluences that together work to shorten the distance between food source to personal and family plates (i.e. individual and household dietary behaviors, food choices and preferences).
Figure 6.1 Emergent constructs in the proposed Geo-Nomics Theory and Framework. On the following page, Figure 6.2 illustrates the application of these proposed theoretical Geo-Nomics constructs to ethnographic study findings of this dissertation.
Figure 6.2 Emergent Geo-Nomics Conceptual Framework applied to Ethnographic Findings
Geo-Nomics and Future Research Directions

Future research directions regarding the ideas forwarded by Geo-Nomics includes the exploration and refinement of the preliminary constructs proposed in this dissertation in addition to an examination of the extent to which earth-plate proximity as a concept can be applied to dietary behavior in diverse populations. Earth-Plate Proximity may be defined as an emergent concept, forwarded by findings of this dissertation, earth plate proximity refers to the distance between one’s food source and one’s plate. It necessarily encompasses the time it takes for food to traverse the distance between its original source and the individual’s plate, or the household menu of the day, depending on whether the outcome of interest is individual versus family dietary behavior. This still proximity refers to long distances whereas proximal proximity refers to a shorter ones such as those that are applicable to the Kichwas community, several of whom enjoy the privilege of walking outside to their well-tended garden, picking produce for the day, then placing it on their plates or in the hands of their children. The proposed Geo-Nomics constructs are preliminary and require further research for refinement and future development. These ideas aim to aggregate the array of geocultural, ecological, interpersonal and intrapersonal confluences that synergistically create a resilience inventory (i.e. cumulative and aggregate positive exposures that increase resilience among the Kichwas community, who actively resist dietary westernization). Together, these resilience synergies delineate the proximal path within the earth-plate proximity that the Kichwas enjoy. This in turn signifies a high-quality diet punctuates by fruits and vegetables as a cultural and quotidian way of life that ensures health and vitality among the Kichwas people.
Lessons Learned

Difficulties with conducting reliability analyses suggest that further iterations of this instrument require a much larger and more diverse sample size that include comparison groups between urban and rural populations. Specific strategies to deal with missing data should be delineated ahead of time (Scheffer, 2002). Item responses are nevertheless useful as an audience segmentation tool to give health professionals a quick overview of general lifestyle trends regarding risk and resilience in the face of chronic disease. Administration of the survey using a cross-cultural team also presented numerous hinges which made it difficult to monitor the quality and standardization of data collection procedures.

It is also recommended that further instruments be able to stand alone and include all necessary demographic data that can be quickly used to assess whether the sample is urban or rural, has access to transportation, lives in agricultural lifestyle, has access to our home garden. Each assessment instrument developed should thus be a stand-alone instrument that independently collects demographic data and as much data as possible which are relevant to the guiding research questions. This stipulation avoids unnecessary complications which may arise during data analysis.

Qualitative data in this study indicates that the sample is rural and agricultural, with several participants owning or having access to home gardens. Further guide iterations of the tool should also include demographics that can be used as benchmarks to gauge the general distance between the earth and the plate for participants. High response rates suggest that items resonated with the sample while low response rates suggest that items did not align with their lifestyle. Based on the response rates to specific questions, key constructs for the sample are traditional and homemade meal consumption; consumption of bread rice and soda, general activity levels,
food as a form of identity and household health outcomes. It is advised to nevertheless include a child dietary scale and future iterations, despite the low response rate among this homogenous sample for child dietary preferences that are risky. Interestingly, on account of the traditional diet of the sample, they were very high response rate for child resilience question relating to the frequency of their consumption of homemade and traditional meals. In future, cultural consensus methodology would also present useful quantitative information about the best items that should be included in future iterations of this tool.

With respect to cross-cultural ethnographic research, it is essential to conduct community-engaged research in conjunction with members of the target community. This circumvents cross-cultural misunderstandings that impede clear communication and probing during interviews. The aid of community members is most critical during semi-structured interviews and participant observation. Ethnographic research and data-gathering relies more heavily on the researcher’s powers of observation and ability to build rapport with community members. While time and resources are often limiting factors, it is also ideal to engage in community-building activities that are not directly related to one’s work – this builds trust and established more secure relationships, through which the researcher may gain insider insight into phenomena observed.

Triangulation in mixed methods cross-cultural studies is a challenging process that requires both cultural and methodological expertise consultation. It is imperative to note that the data gathered may in some way fall short of the initial research vision. Thus, a clear, concrete and flexible data analysis plan that caters for shortcomings in data (either through item responses, sample size or execution of one or more qualitative methods) should be considered. Trends observed in quantitative data must be contextualized in terms of qualitative data, which
can provide explanations for anomalies or data trends that do not conform to the literature or expected findings regarding lifestyle constructs within the target community.

**Limitations of this Study**

These include the small sample sizes of the study: 34 in-depth interviewees and 95 survey participants. This was largely due to the limited resources that were available to fund this international work. Additionally, interviewees’ mistrust of foreigners precluded the possibility of taping interviews. The sample largely came from rural agricultural areas in the Imbabura province of Ecuador, which means that sampling bias forms another limitation. Missing data within measured chronic disease was also a considerable limitation. Furthermore, the cultural uniqueness of this indigenous population means that this study has low generalizability, despite its high internal validity attained through the triangulation of diverse methods.

While the complementarity and expansion that results from triangulation in the current study make this research strong, it should be noted that there are several weaknesses in this research design. Firstly, it was intensive regarding time, labor and resources; this research must be conducted on a limited budget. As such, transcripts were not be possible due to a lack of funding. Additionally, sequential nested sampling presents the complications that accompany data collection when it is not collected by the primary researcher, who did not personally administer the NTQ survey in Ecuador. It should also be noted that another weakness of this study is the relatively small sample size (n=95 survey participants; n=34 in-depth interviews; n=25 intercept interviews). This small sample size means that conclusions discussed here have limited external generalizability.
**Strengths of this Study**

This study used multiple strands of inquiry which, when integrated, together achieve the research aims set out at the beginning of this paper. While quantitative data assessed individual and household health status, in addition to key constructs of the nutrition transition, qualitative data provided insight regarding the nuances of various socio-cultural factors and life style shifts that are syndemically connected to the nutrition transition.

Additional strengths include the utilization of a variety or methodologies that facilitated triangulation of the data collected, in keeping with the tenets of a convergent parallel mixed methods design. Community liaisons facilitated data collection, while ethnography ensured cultural sensitivity and relevance was observed in all aspects of data collection. Products of this work include: 1) The NTQ lifestyle assessment instrument as well as an accompanying methodology that can be applied within other populations in the future; 2) An emergent geo-nomics theory that can be used to explore and assess various facets of risk and resilience regarding lifestyle related health outcomes within international settings; 3) An intervention that promotes thermoses for the use of carrying a packed, warm lunch to prevent consumption of fast food. These products contribute notable novelty and innovation to the field of global nutrition, particularly as it relates to indigenous health. This study attempts to address gaps in the literature regarding lifestyle assessment, theories regarding nutrition beliefs and behaviors in diverse foreign settings, as well as possible solutions to the risk of chronic disease within at-risk populations who consume fast food throughout the work day.
Discussion Summary

This discussion explored the findings of this study in the context of the literature. It addresses several existing gaps in knowledge that include the role of men and women in food planning and preparation, access to home gardens as a protective factor against lifestyle illnesses; and potential contributions of this study to the literature, including a new emergent theory that addresses the gaps in syndemic theory, positive deviance and the food choice process model which shaped the theoretical conceptualization of this study. Strengths, limitations and public health implications of this study were also considered.
Chapter 7. Conclusion and Potential Research, Practice and Policy Implications

Introduction

This study has the potential to contribute knowledge necessary to create a cogent multi-level framework to identify and address syndemic factors that facilitate and may impede the spread of the NT and its nefarious health detriments. This framework should incorporate research, practice and policy in order to address health care needs at the primary, secondary and tertiary level that arise in response to the NT. This conclusion focuses on research, practice and policy implications of this study. It features a final conclusion that serves to complete this work.

Research

Potential research contributions of study findings from the current study include the following: identification of syndemic factors that elevate health risks associated with the NT; identification of specific behavioral risk factors for chronic disease at individual and household levels; an overview of food system barriers and assets in Ecuador that affect indigenous households; identification of the differences in behaviors and beliefs of resilient individuals versus those at high risk of developing chronic disease due to lifestyle choices. Quantitative findings contribute towards a revised lifestyle assessment tool that can quickly assess risk behaviors regarding diet and physical activity.

Overall research implications of this study are that: 1) Interviews shed insight regarding households that engage in protective versus risky behaviors that consequently impact family members’ susceptibility to the ongoing nutrition transition; 2) Ethnographic data indicate the
factors of the food system landscape within communities that may either perpetuate or protect households from the effects of the nutrition transition; 3) Quantitative data provides insight regarding the development of a pilot tool that can lifestyle risk regarding chronic disease.

Thus, future research can: 1) Explore the extrapolation of qualitative findings to other indigenous communities in Ecuador, and, eventually, South America; 2) Further delineate the features of community food systems that either elevate or insulate individuals from the risks of developing chronic disease; 3) Pilot and validate the revised version of the Nutrition Transition Questionnaire (NTQ) in other populations and countries throughout the world.

**Practice**

The most promising findings of this study regarding intervention design are: the exchange of fruits and vegetables between friends and neighbors to diversify the diet as well as their openness to the idea of using a thermos to pack lunch. The willingness of friends and neighbors to share their produce opens the possibility to community gardens and co-operatives for public health practitioners. Interventions that capitalize upon Kichwas cultural pride and collective culture are more likely to be successful than those that were influenced by western logic models that largely originated in the United Stated and the United Kingdom.

Public health practitioners can use the knowledge outlined above in the following ways: the design of dietary and physical activity interventions that address issues related to risk and resilience in a culturally sensitive manner; identification of ways in which policy makers can change the food system landscape to promote healthier lifestyles; application of qualitative findings to form the basis of culturally sensitive health education materials regarding the value of traditional staples, and the dangers of soda consumption, processed and fast foods; health promotion to foster larger market support for locally grown produce in urban areas experiencing market penetration and ease of access to imported products.
Policy

Researchers acknowledge that governments need to find ways to encourage and increase per capita energy expenditure (Popkin et al., 2012) – this is especially difficult in developing countries with limited social infrastructure capable of meeting the demands of such an initiative. Scholars suggest a ballpark baseline of 30 minutes of daily exercise to compensate for the general increase in calorie intake (Popkin et al., 2012). This recommendation is not entirely realistic for adults who lack the time to exercise. Researchers therefore emphasize that diet modification should be promoted (Popkin et al., 2012). For example, the practice of eating two sources of carbohydrates at meals should be discouraged; the second carbohydrate can be replaced with a salad. While these recommendations are relevant, supportive policies that promote healthy lifestyles are also critical to the success of such recommendations in communities that are undergoing rapid cultural, economic and lifestyle shifts on account of the nutrition transition.

Study findings can inform municipal government authorities regarding the most relevant avenues, messages and resources to help communities to protect themselves from the deleterious effects of the NT. This study also has the potential to provide policy-makers with evidence-based recommendations to effectively accomplish the latter goal. For example, policy-makers can be encouraged to invest in subsidizing in the cost of thermoses for men to carry lunch to work rather than eat fast food, which contributes to chronic disease risk. Thus, this current work can serve as a critical step forward in the fight to protect communities from premature chronic illness and, ultimately, the tragedy of preventable mortality increasingly associated with the nutrition transition.
Public Health Implications

Future directions of research based on this study include further testing, development and validation of the NTQ lifestyle assessment instrument as well as the eventual dissemination of this instrument to public health professionals who are committed to preventing chronic disease. The mixed methods design of this study also suggests that future work regarding the nutrition transition should include the triangulation of both quantitative, qualitative and ethnographic methods. It should also be noted that indigenous health research requires community engagement through respected leaders within the community. Additionally, future researchers should consider methods of addressing and overcoming language barriers that they are inevitable when conducting indigenous health research.
Conclusion

This study has made important contributions to our understanding of the nutrition transition among the Kichwas people. Firstly, this transition is occurring differently between urban and rural Kichwas. This study took place among rural Kichwas whereas the preceding study which led to this work was conducted among urban Kichwas. This accounts for the low levels of self-reported chronic disease in the study sample. The communities studied also appear to be largely positively deviant in relation to their urban counterparts, most notably in that the majority of the sample (both qualitative and quantitative) indicated that they eat the majority of their meals at home, where women remain the chief of the home in terms of cooking, meal-planning, and horticulture.

This study also makes novel theoretical contributions – geo-nomics theory addresses gaps in syndemic theory and other theories that are used to explain and explore community level lifestyle trends. Additionally, this study provides a striking finding – the proximity between the earth and plate, a dimension term coined “Plate Proximity” by this author, appears to mediate the risk of chronic disease versus lifestyle wellness. This term can potentially provide future illumination regarding future research that examines this concept in further detail, among other populations, including those residing with the United States. Methodologically, mixed methods is essential in the creation of instrument development and testing, so that qualitative data can contextualize quantitative findings and vice versa. Cross-cultural research regarding lifestyle risk and resilience remains a gap in the literature which should be addressed so that future policies and interventions can be culturally relevant within both domestic and global arenas.
Chapter 8: Photo Album

Research Setting
A photo taken in the Tukuru area where ethnographic work was conducted
The Imbabura mountain forms an impressive backdrop to daily life in Turuku
A countryside home in Morochos where altitude and climate complicate citrus cultivation
A picture of me in Morochos where the cold climate decreases dietary diversity

Middle: Downtown Cotacachi. Bottom: Cotapaxi volcanic cráter lake.
Grains in the marketplace

Beans and the $Ahí$ pepper

*Sopa de arroz de cebada* (rice soup with vegetables), a popular dish in Kichwas culture
Evidence of the thriving botanical medicine that is integrated into the Kichwas syncretic religion of the Mama Pacha belief system. This religion also influences artwork and jewelry designed by the Otavalo Kichwas traders. Above is an image of two brands of valerian extract (extreme left); rosemary and chamomile essential oils (left); a neck pillow stuffed with a mixture of dried lavender, chamomile, caléndula and flax sedes (striped pillow at center); two type of propoleo extract (one with garlic and one without) that is used to ward off respiratory infections, colds and viruses (lower right corner); tea referred to as a mixture for women’s illnesses, or compuesto por enfermedades de la mujer (upper right corner); 29 plantas – a tea of 29 plants made for male and female reproductive health (center right); sangre de drago (dragon’s blood) that is used for digestive illnesses (center left); dried caléndula (top left corner); and an analgesic gel made from ginger (center above striped pillow).
Bread Minga

Men and womrn gather around bowls of dough and leisurely shape bread rolls as they catch the latest gossip. Bread is placed on metal trays attached to wooden poles. They are then placed in this large outdoor clay oven (my host mother named hers Carmen Rosita), which burns bread if meat is not first cooked on the hot coals inside the oven.
Bean sifting *Minga* with Kichwas women in Morochos. Mingas help to maintain social bonds and facilitate efficient horticultural food production activities.

Corn sifting *Minga*. Dried corn kernels are sifted into three bags: large, plump kernels; small kernels; and rotten kernels that are used to feed the family pigs and other livestock.
Dried corn for family consumption outside a rural Kichwas home in Morochos. This photo also shows that in some households men are actively involved in the horticultural lifestyle of the rural Kichwas, since this man clearly helps with the corn production for the family. To the left are the two local nurses who helped with conducting in-depth interviews. These nurses also administered the NTQ survey that was analyzed as secondary data for this dissertation.
Fruits and vegetables are a way of life, central to indigenous Kichwas identity
Fruits are ubiquitous in corner stores in Cotacachi

Fruits were the prize we received at a community festival. The prize symbolizes the cultural value assigned to fruits and vegetables, soda and liquor. There are two bottles of red rum, and two bottles of Coke. This suggests that liquor and soda are considered occasional treats while fresh produce is the mainstay of the traditional Kichwas diet.
Fruits regularly and generously grace Kichwas kitchen countertops. A hand of bananas hangs from the ceiling close to the fridge (top left); *chilemoya*, ripe plaintains, papaya and red beans are proudly displayed in a wealthy Kichwas home (top right); cabbage, papaya and fresh lemons are on display in a home in Turuku (bottom left).
Evidence of Food sovereignty and Kichwas food quality values: There is a vibrant movement that advocates for organic, non-genetically modified (libre de transgenicos) Food.

Fruit availability facilitates income opportunities for women such as this smoothie stand

Women also sell fruits to gain income
Steep slopes facilitate physical activity, particularly for women who carry the weight of dried corn husks from the fields to their homes where it is stored in canvas bags before being layed out to dry in the sun and sifted in a *minga*. People also use physical activity as an opportunity to socialize with friends and neighbors since they often walk with or go bike riding with others.
Cats protect crops

Dogs protect children as they play at night in a basketball court, thereby facilitating physical activity.
Guinea pigs raised as a delicacy (above). An elaborate Kichwas home garden referred to as *huerto* (below). This garden is impressively well tended and grows a variety of produce – the owner proudly took us for a tour.
A woman walking her pig in Morochos (above). White squash referred to as *zambo* that is eaten as a dessert with *tortillas de maíz* (corn tortillas) (below).
Salchipapas (hot dogs and potatoes), a popular fast food referred to as *la comida chatarra*. This photo was taken at a community festival where fast food abounds. *Salchipapas* are also a popular food with teenagers – below is a photo of sausages, eggs and rice, which one teen made for himself.
Colostrum – A rare delicacy that one Kichwas family boils and drinks each day, *una copita cada dia* (a daily shot) for adults and children alike.
Making and eating corn tortillas, served with sweetened zambo squash, top right.
References


Indigenous Communities In Ecuador And Panama. Paper presented at the American Public Health Association (APHA), Atlanta, Georgia.


Roberts, C., Campbell, I., & Troop, N. (2014). Increases in weight during chronic stress are partially associated with a switch in food choice towards increased carbohydrate and saturated fat intake. *European Eating Disorders Review, 22*(1), 77-82.


Appendix A

Author’s permission to reproduce image on page 48

Vanessa Chee <vachee@mail.usf.edu>
To: "Popkin, Barry M" <popkin@unc.edu>

Wed, Jun 27, 2018 at 5:29 PM

Dear Dr. Popkin,

I am in the process of submitting my dissertation for publication in ProQuest and I would like to request your kind permission to reproduce the following image taken from your work. I look forward to hearing from you.

Sincerely,

Vanessa Alicia Chee, PhD
College of Public Health,
University of South Florida

Popkin, Barry M <popkin@unc.edu>
To: Vanessa Chee <vachee@mail.usf.edu>

Wed, Jun 27, 2018 at 5:30 PM

Of course yes.
Appendix B

Global burden of disease study 2013 (GBD, 2016)

<table>
<thead>
<tr>
<th>Cause (Both Sexes, All ages, 2013)</th>
<th>Metric</th>
<th>Avg cause fraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malnutrition</td>
<td>Deaths</td>
<td>3%</td>
</tr>
<tr>
<td>Malnutrition</td>
<td>DALYs</td>
<td>7%</td>
</tr>
<tr>
<td>Childhood stunting</td>
<td>Deaths</td>
<td>0%</td>
</tr>
<tr>
<td>Childhood stunting</td>
<td>DALYs</td>
<td>1%</td>
</tr>
<tr>
<td>Childhood undernutrition</td>
<td>Deaths</td>
<td>2%</td>
</tr>
<tr>
<td>Childhood undernutrition</td>
<td>DALYs</td>
<td>4%</td>
</tr>
<tr>
<td>Childhood wasting</td>
<td>Deaths</td>
<td>2%</td>
</tr>
<tr>
<td>Childhood wasting</td>
<td>DALYs</td>
<td>4%</td>
</tr>
</tbody>
</table>
### Appendix C

#### Constructs within the Food Choice Process Model (Sobal et al., 2006)

<table>
<thead>
<tr>
<th>Reference: (Sobal et al., 2006)</th>
<th>Categories</th>
<th>Constructs</th>
<th>Conceptual Definition</th>
<th>Operational Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Course</td>
<td>Temporal</td>
<td>Trajectories</td>
<td>Thoughts, feelings, strategies and actions over the lifespan</td>
<td>Lifelong salad eaters</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transitions</td>
<td>Shifts that lead to changes OR solidify continuation of behavior of food choice patterns</td>
<td>Major life events - entering or leaving school, changing employment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Timing</td>
<td>Turning points in the lifecourse that influence food choice</td>
<td>Eating healthier when pregnant</td>
</tr>
<tr>
<td>Influences [Contextual and individual influences]</td>
<td>Individual influences</td>
<td>Ideals</td>
<td>Standards people learn through socialization and acculturation</td>
<td>What and how one eats. Ex meals and manners, health</td>
</tr>
<tr>
<td></td>
<td>Individual factors</td>
<td>Physiological (genetic, personality), psychological (personality/mood), relational (identities, self-concept)</td>
<td>Food choices represent self-image</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resources</td>
<td>Assets-physical ($, equipment, space) or intangible (time, skills, knowledge)</td>
<td>Ex. Low income people have to deal with changing financial status which influences food choice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Social Factors</td>
<td>Group norms and commensal dietary behavior</td>
<td>Roles, families, groups, networks, organizations, communities</td>
<td></td>
</tr>
<tr>
<td>Influences</td>
<td>Contextual Influences</td>
<td>Macro Environments</td>
<td>Social structure, economic conditions, historical eras</td>
<td>Early 20th century people did not want to throw food away, no waste.</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-----------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td>Micro Environments</td>
<td></td>
<td>Physical surroundings, social institutions, seasonal change</td>
<td>Home and workplace are key influences in food choice</td>
<td></td>
</tr>
<tr>
<td>Personal System</td>
<td>Personal Food System</td>
<td>Values</td>
<td>Set of considerations, personal interest and meanings and emotional affects and attachments</td>
<td>Taste, convenience, cost, health and managing relationships</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Taste</td>
<td>Sensory perception</td>
<td>Appearance, odor, flavor, texture, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Convenience</td>
<td>Time and effort</td>
<td>Physical ability, and mental and physical involvement that it takes to prepare, consume, clean up food</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cost</td>
<td>Monetary considerations</td>
<td>Eat at home or out dependent upon cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Health</td>
<td>Physical well-being</td>
<td>Low fat, weight control, naturalness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Managing relationships</td>
<td>Interests and well-being of other people in one’s social world (catering to the needs and preferences of others)</td>
<td>Newlyweds negotiating food choices or parent-child relationships</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Identity values</td>
<td>Quality</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Variety</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Symbolism</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Ethics</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Safety &amp; waste</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Religion</td>
<td>Religiously significant food: Ex. Beef for Hindus, Bread and wine for Christians</td>
</tr>
<tr>
<td>Personal system</td>
<td>Cognitive System</td>
<td>Classification System</td>
<td>Refers to the classification categories for food that people use to identify and group food options</td>
<td>Examples include “cheap” versus “healthy,” “unhealthy”, “unhealthy”, “unhealthy”, “we both like these foods”</td>
</tr>
</tbody>
</table>
Classification categories include all possible classifications; culturally recognizable classifications; socially significant classifications; personally operational classifications

<table>
<thead>
<tr>
<th>Personal system</th>
<th>Cognitive</th>
<th>Value negotiation</th>
<th>Value prioritization that occurs concurrently with food rating and choice options based on the hierarchy of salient values. Resolving value conflicts and negotiating trade-offs</th>
<th>Tradeoffs occur when one must choose between opposing values such as tasty cheap snack versus an expensive healthy one</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal system</td>
<td>Cognitive</td>
<td>Balancing</td>
<td>Ensuring that salient food values are met</td>
<td>Ex. Healthy foods during the week and desserts only during the weekend</td>
</tr>
<tr>
<td>Personal system</td>
<td>Cognitive</td>
<td>Heuristic Strategies</td>
<td>Focusing on one value</td>
<td>Emphasize only cost, taste, health, relationships, convenience or another value (ex. Eat the cheapest food available)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Routinization</td>
<td>Standardize, systematize, ritualize (ex. Eating toast for breakfast every morning)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elimination</td>
<td>Avoid, exclude, prohibit (ex. Avoid all foods with high fructose corn syrup)</td>
<td></td>
</tr>
<tr>
<td>Action</td>
<td>Example</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limitation</td>
<td>Restrict, regulate, reduce (ex. Drink a maximum of 2 glasses of wine each night)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substitution</td>
<td>Replace, exchange, fill in (ex. Choose lean meat instead of dark meet)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Addition</td>
<td>Augment, include, enhance (ex. Have soup as an appetizer in the evenings, have a vegetable with every meal)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modification</td>
<td>Alter, adjust, transform (grill versus fry)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D
Syndemic theory applied to data analysis regarding the nutrition transition

EMERGENT SYNDOMIC ANALYSIS
Syndemic theory applied to emergent themes will examine interaction among themes during applied thematic analysis.

A PRIORI SYNDOMIC ANALYSIS
Syndemic theory will be applied to a priori themes using this conceptual framework, derived from focus group data collected in the same communities. The nutrition transition is depicted as the result of syndemic factors: cultural shifts and loss of heritage (la desculturización); urbanization and household dietary changes.
Appendix E.

Nutrition Transition Questionnaire (NTQ) English

Employment and urbanization
Please answer the following questions about your working life:
1. Do you work outside the home?
   YES □ NO □

   If you answered NO, please follow to question 29:
2. What kind of work do you do?
   ___________________________________________________

3. What is your work schedule?
   ___________________________________________________

4. Where do you work?
   ___________________________________________________

5. How far from the house is your job? _________ Kms.
6. How long does it take to get to work? ________ min
7. How do you get to your job? (Check all that apply)
   □ Bus ___
   □ Walking ___
   □ Bicycle ___
   □ Carriage Driving ___

8. Who is employed outside the home? (Check all that apply)
   □ Husband □ Wife □ Abuela □ Abuelo □ Daughter □ Son

9. For my work schedule makes it hard to eat traditional homemade food such as corn, potatoes and coladas (soups):
   YES □ NO □

10. For my work schedule makes it difficult for my family to eat traditional home-cooked meals such as corn, potatoes and coladas (soups):
    YES □ NO □

Food safety
I would like to ask about the availability of food in your home:
11. In the last 12 months, have you or another adult had to reduce the amount of your food, or stopped eating because there was not enough food for the rest?
    YES □ NO □

12. In the last 12 months, once you've had to eat less than I thought because there was not enough food for the rest?
13. In the last 12 months, ever You had hungry but did not eat because there was not enough at home?  
YES □ NO □

**Food consumption patterns**
I would like to ask you about what you eat:
14. Who did you eat and drink yesterday?
Breakfast: ____________________
Snack: ______________________
Lunch: ______________________
Snack: ______________________
Dinner: ______________________
Snack: ______________________
Snack: ______________________

**Individual feeding behavior**
Please answer the following questions about your diet:

15. In what places do you usually eat? (Check all that apply)
Home □
School □
Work □
On the road to work □
On the way home street □
On the bus □
At a friend's house □
Other (specify) ______________ □

**Traditional food**
16. Which local / traditional foods you eat often or almost every day?:
___________________________________________________

17. Are those traditional foods mentioned earlier part of their cultural identity?
YES □ NO □
18. Most of their diet consists of traditional foods like corn, potatoes and coladas?
YES □ NO □
19. Most of the foods you eat are prepared at home?
YES □ NO □
20. When you were small (a) consumed many home-cooked meals?
YES □ NO □
21. When you were small (a) consumed many traditional foods?
YES □ NO □
22. How often do you eat local / traditional food?
Every day □
2-3 times / week □
Once / week □
Twice / month □
Once / month □
Never □
Junk food
23. You eat fast food or junk food?
YES □ NO □
If you answered yes, please answer the following:

24. How often do you eat fast food?
Every day ___
2-3 times / week _____
Once / week ___
Twice / month ___
Once / month ___
Never. ___

25. How many days a week?
□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
26. How many times each day?
□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
27. If you eat fast food, what kind of fast food is what you normally eat? List.

___________________________________________________

28. Consumes often fried foods and fast food (junk)?
YES □ NO □
29. Consume processed foods (canned, sausages, juice drinks)?
YES □ NO □

Eating behavior of households
Meals prepared at home
Please indicate what you consider a meal homemade for:
30. Breakfast: ____________________________
31. Lunch: ____________________________
32. Snack: ____________________________

Please indicate what your parents usually for:
33. Breakfast: ____________________________
34. Lunch: ____________________________
35. Snack: ____________________________

Please indicate what your kids usually eat for:
36. Breakfast: ____________________________
37. Lunch: ____________________________
38. Snack: ____________________________

Please answer the following questions about the foods eaten at home:
39. The food prepared at home usually food is traditional food?
YES □ NO □
40. The food prepared at home is usually processed packaged food?
YES □ NO □
41. Nobody in their home have the time to prepare home-cooked meal?
YES □ NO □
42. Someone in your family prepares homemade meals every day or spending a day?
YES □ NO □
43. How often your entire family together eat homemade food?
□ Every day □ 2-3 times / week □ 4-6 times / week □ 1 / week □ 2 / month □ 1 / month □ Never
44. How often does your family eat together outside the home?
□ Every day □ 2-3 times / week □ 4-6 times / week □ 1 / week □ 2 / month □ 1 / month □ Never
45. How often do you eat homemade food?
□ Every day □ 2-3 times / week □ 4-6 times / week □ 1 / week □ 2 / month □ 1 / month □ Never
46. How often do your parents eat homemade food?
□ Every day □ 2-3 times / week □ 4-6 times / week □ 1 / week □ 2 / month □ 1 / month □ Never
47. How often do your children eat homemade food?
□ Every day □ 2-3 times / week □ 4-6 times / week □ 1 / week □ 2 / month □ 1 / month □ Never

**Household diet**
48. Consume bread at home?
YES □ NO □
49. If you answered yes, how many days a week?
□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
50. Does your household eat rice?
YES □ NO □
51. If you answered yes, how many days a week?
□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7
52. Does your household consume fast food (junk)?
YES □ NO □
53. If you answered yes, how many days a week?
□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7

**Soda consumption**
54. Do you take soft drinks (cola)?
YES □ NO □
55. If the answer was yes, how many times a day you drink soda?
□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ 8 □ 9 □ 10
56. How many times did you drink soda every week?
□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ 8 □ 9 □ 10
57. Do your children take gas?
YES □ NO □
58. If the answer was yes, how many times per day gas generally take them?
□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ 8 □ 9 □ 10
59. Do your parents take gas?
YES □ NO □
60. If the answer was yes, how many times per day gas generally take them?
□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ 8 □ 9 □ 10

**Child feeding practices**
Please answer the following questions about the diet of their children:
61. How many children (under 18) is in your house? _____
62. Do you have children?
YES □ NO □
If you answered NO, go to question 98
63. Who feeding children at home most of the time?
☐ ☐ You ☐ Spouse ☐ Grandmother ☐ Grandfather ☐ Wife

64. Who feeds the children of your home while you work?
☐ Husband ☐ Wife ☐ you ☐ Grandmother ☐ Grandfather ☐ Other (babysitter, neighbor, etc)

65. Do Your children eat breakfast?
YES ☐ NO ☐

66. If yes, where usually they eat breakfast?
☐ School ☐ House

67. My children often eat traditional foods prepared at home
YES ☐ NO ☐

68. How often do your children eat home-cooked meals?
☐ Every day ☐ 2-3 times / week ☐ 4-6 times/week ☐ 1 / week ☐ 2 / month ☐ 1 / month ☐ Never

69. Do your children eat food prepared outside the home?
YES ☐ NO ☐

70. If the answer was yes, how many days a week?
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

71. Do your children eat fast food (junk)?
YES ☐ NO ☐

72. If the answer is yes, how many days a week?
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

Baby food preferences
73. Your children prefer to eat junk food (fast) rather than traditional food?
YES ☐ NO ☐

74. Your children prefer sweets instead of traditional food?
YES ☐ NO ☐

75. Your children prefer snacks (candy) processed instead of traditional home cooking?
YES ☐ NO ☐

76. Your children prefer colas or sodas instead of water and juice?
YES ☐ NO ☐

Food system
77. Where usually buy / get your food? (Check all that apply):
☐ Huerto home ☐
☐ Garden of neighbors ☐
☐ Community Garden ☐
☐ Market ☐
☐ Supermarket ☐
☐ Other (specify) ________________________

78. How often you eat food grown in your garden or orchard neighbors?
☐ Every day ☐ 2-3 times / week ☐ 4-6 times / week ☐ 1 / week ☐ 2 / month ☐ 1 / month ☐ Never

Physical activity
79. In the last year, how would you describe your exercise compared to previous years (choose one):
More physical activity ☐ less physical activity ☐ no physical activity

80. In the last year, you spend more time sitting than walking?
YES ☐ NO ☐
81. You exercise regularly? (At least 3 times / week)
YES □ NO □

**Westernization**
82. How many hours per day watching TV?
□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ 8 □ 9 or more
83. How many hours a day do you spend on your cell phone (text messaging, games, whatsapp, etc.)?
□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ 8 □ 9 or more
84. How many hours a day passes online?
□ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ 8 □ 9 or more
85. Do you eat while watching TV?
YES □ NO □
86. If you answered YES, what do you eat and drink while watching television:
_____________________________________________________________________

87. Are there any foods or snacks you eat, because you saw them advertised on television?
YES □ NO □
88. Do your children ask you to buy food or snacks because they see them on TV?
YES □ NO □

**Health status**
89. Someone in your house has had diseases such as cholera, diarrhea, dengue or yellow fever?
YES □ NO □
90. Have you ever been diagnosed with diabetes?
YES □ NO □
91. Have you ever been diagnosed with high blood pressure?
YES □ NO □
92. It has been diagnosed with heart disease?
YES □ NO □
93. Have you ever had a stroke (stroke)?
YES □ NO □
94. Has anyone in your household has been diagnosed with diabetes?
YES □ NO □
95. Has anyone in your household has been diagnosed with high blood pressure?
YES □ NO □
96. Has anyone in your household has been diagnosed with heart disease?
YES □ NO □
97. Has anyone in your household had a stroke?
YES □ NO □
98. If yes, how many people in your household, including you, they have been diagnosed with diabetes, high blood pressure or heart disease? __________

**Dental problems**
This section will ask you about dental problems you may have experienced.
99. Do you have any cavities?
YES □ NO □
100. If yes, how many? ____
101. Have you lost any teeth?
102. If yes, how many? _____
103. Do you have problems chewing?
YES □ NO □
104. In your house, who decides what you eat?
105. □ I □ My Husband Wife □ My mother □ My father □ Someone else

Recruitment form
Hello, my name is Vanessa Chee and I am part of the working group study Isabel Hernandez. I would like to track and understand more about your diet and your family. I'm collecting this information for my thesis at the University of South Florida in the United States. If you are interested in talking to me in person, please provide your contact information and time availability below:
My name is _________________________ and I'm interested in talking more about nutrition and physical activity.
Phone: ________________________________________
Address: ________________________________________________________________
Email: ____________________________________________
The best time to call is (check every time we call):
☐ In the morning between 9 am and 12 pm
☐ In the evening between 12 pm and 5 pm
☐ In the evening between 5 pm and 8 pm
☐ On weekends
Appendix F.

Nutrition Transition Questionnaire (NTQ) Spanish

Empleo y urbanización
Por favor responda las siguientes preguntas sobre su vida laboral:
1. ¿Usted trabaja fuera del hogar?
   SÍ □  NO □  
Si su respuesta fue NO, por favor siga a la pregunta 29:
2. ¿Qué tipo de trabajo hace usted?

3. ¿Cuál es su horario de trabajo? Indique las horas generales y los días:

4. ¿Dónde trabaja? Indique el tipo de empleo que trabajas allí:

5. A qué distancia de la casa se encuentra su trabajo? _______ Kms
6. ¿Cuánto tiempo se tarda en llegar al trabajo? ______ minutos _____ Horas
7. ¿Cómo va a su trabajo? Indique todo que aplica:
   □ Autobús  □ Caminando  □ Bicicleta  □ Manejando carro
8. ¿Quién trabaja en su hogar? (indique todas las que apliquen)
   □ Ud □ Esposo □ Esposa □ Abuela □ Abuelo □ Otro (niñera, vecina, etc)

9. Por mi horario de trabajo se me hace difícil comer comidas casera tradicional como el maíz, papas y coladas (sopas):
   SÍ □  NO □  
10. Por mi horario de trabajo se hace difícil para mi familia comer comidas caseras tradicionales como maíz, papas y coladas (sopas):
     SÍ □  NO □  

Seguridad alimentaria
Me gustaría preguntarle sobre la disponibilidad de alimentos en su hogar:
11. En los últimos 12 meses, Usted u otro adulto ha tenido que disminuir la cantidad de su comida, o dejado de comer, porque no había suficiente comida para el resto?
    SÍ □  NO □  NO SE □  
12. En los últimos 12 meses, alguna vez Usted ha tenido que comer menos de lo que pensaba porque no había suficiente comida para el resto?
    SÍ □  NO □  NO SE □  
13. En los últimos 12 meses, alguna vez Usted se tuvo hambre pero no comió porque no había suficiente en casa?
    SÍ □  NO □  NO SE □  

Patrones de consumo de alimentos
Me gustaría preguntarle sobre lo que Usted come:
14. Que comió y bebió ayer?
<table>
<thead>
<tr>
<th>Comida</th>
<th>Alimento</th>
<th>Bebida</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desayuno</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Almuerzo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Merienda</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerio</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conducta alimentaria individual**

Por favor responda las siguientes preguntas sobre su dieta:

15. En qué lugares usualmente come? (marque todas las que apliquen)
- [ ] Casa
- [ ] Colegio
- [ ] Trabajo
- [ ] En la calle camino al trabajo
- [ ] En la calle camino a casa
- [ ] En el bus
- [ ] En casa de un amigo
- [ ] Otro (especifique)

16. Que alimentos locales/tradicionales consume usted a menudo o casi todos los días?:
___________________________________________________

17. Son esos alimentos tradicionales que mencionó antes parte de su identidad cultural?
- [ ] SÍ
- [ ] NO

18. La mayor parte de su dieta se compone de alimentos tradicionales como maíz, papas y coladas?
- [ ] SÍ
- [ ] NO

19. La mayor parte de los alimentos que consume se preparan en su casa?
- [ ] SÍ
- [ ] NO

20. Cuando Usted era pequeño(a) consumía muchas comidas hechas en casa?
- [ ] SÍ
- [ ] NO

21. Cuando Usted era pequeño(a) consumía muchas comidas tradicionales?
- [ ] SÍ
- [ ] NO

22. ¿Con que frecuencia Usted come alimentos locales/tradicionales?
- [ ] Cada día
- [ ] 4-6 veces/semana
- [ ] 2-3 veces/semana
- [ ] Una vez / semana
- [ ] Dos veces / mes
- [ ] Una vez / mes
- [ ] Nunca

23. Usted consume comida rápida o comida chatarra?
- [ ] SÍ
- [ ] NO

Si su respuesta fue SÍ, por favor conteste las siguientes:

24. ¿Cuántas veces consume comida rápida?
- [ ] Cada día
- [ ] 4-6 veces/semana
- [ ] 2-3 veces/semana
- [ ] Una vez / semana
- [ ] Dos veces / mes
- [ ] Una vez / mes
- [ ] Nunca

25. ¿Cuántos días por semana?
- □1 □2 □3 □4 □5 □6 □7

26. ¿Cuántas veces cada día?
- □1 □2 □3 □4 □5 □6 □7

27. Si consume la comida rápida, ¿qué tipo de comida rápida es lo que normalmente se come? Enumere.
28. Consume frecuentemente alimentos fritos y comida rápida (chatarra)?
   SÍ □ NO □
29. Consume alimentos procesados (enlatados, embutidos, jugos artificiales)?
   SÍ □ NO □

**La conducta alimentaria de los hogares**

**Comidas preparadas en casa**
Cuando se responde por favor incluya las cantidades también.
Por favor indique lo que Usted considera una comida (alimento y bebida) hecha en casa para:
30. Desayuno: __________________________
31. Almuerzo: __________________________
32. Merienda: __________________________

Por favor indique que comen usualmente sus padres en:
33. Desayuno: __________________________
34. Almuerzo: __________________________
35. Merienda: __________________________

Por favor indique lo que sus hijos comen generalmente en:
36. Desayuno: __________________________
37. Almuerzo: __________________________
38. Merienda: __________________________

**Por favor responda las siguientes preguntas sobre los alimentos que se comen en su casa:**
39. La comida preparada en su casa por lo general es comida tradicional?
   SÍ □ NO □
40. La comida preparadas en su casa es usualmente comida procesada empacada?
   SÍ □ NO □
41. Nadie en su casa tiene el tiempo para preparar comida casera?
   SÍ □ NO □
42. Alguien en su familia prepara comidas casera cada día o pasando un día?
   SÍ □ NO □

43. ¿Qué tan frecuente toda su familia junta ingiere comida casera?
   □ Cada día
   □ 4-6 veces/semana
   □ 2-3 veces/semana
   □ Una vez / semana
   □ Dos veces / mes
   □ Una vez / mes

44. ¿Qué tan frecuente su familia comen juntos fuera de casa?
   □ Cada día
   □ 4-6 veces/semana
   □ 2-3 veces/semana
   □ Una vez / semana
   □ Dos veces / mes
   □ Una vez / mes

45. ¿Qué tan frecuente Usted ingiere comida casera?
   □ Cada día
   □ 4-6 veces/semana
   □ 2-3 veces/semana
   □ Una vez / semana
   □ Dos veces / mes
   □ Una vez / mes

46. ¿Qué tan frecuente sus padres ingieren comida casera?
   □ Cada día
47. ¿Qué tan frecuente sus hijos ingieren comida casera?
- Cada día
- 4-6 veces/semana
- 2-3 veces/semana
- Una vez / semana
- Dos veces / mes
- Una vez / mes

48. ¿Consumen pan en su casa?
- SÍ
- NO

49. Si es que respondió SÍ, cuántos días por semana?
- 1 2 3 4 5 6 7

50. ¿Consumen arroz en su casa?
- SÍ
- NO

51. Si es que respondió SÍ, cuántos días por semana?
- 1 2 3 4 5 6 7

52. ¿En su casa consumen con frecuencia comida rápida (chatarra)?
- SÍ
- NO

53. Si es que respondió SÍ, cuántos días por semana?
- 1 2 3 4 5 6 7

54. ¿Usted toma gaseosas (cola)?
- SÍ
- NO

55. Si la respuesta fue SÍ, cuántas veces toma Usted gaseosa al día?
- 1 2 3 4 5 6 7 8 9 10

56. ¿Cuántas veces usted toma gaseosa cada semana?
- 1 2 3 4 5 6 7 8 9 10

57. ¿Sus hijos toman gaseosa?
- SÍ
- NO

58. Si la respuesta fue SÍ, cuántas veces por día generalmente toman gaseosa ellos?
- 1 2 3 4 5 6 7 8 9 10

59. ¿Sus padres toman gaseosa?
- SÍ
- NO

60. Si la respuesta fue SÍ, cuántas veces por día generalmente toman gaseosa ellos?
- 1 2 3 4 5 6 7 8 9 10

Prácticas de alimentación infantil

Por favor responda las siguientes preguntas sobre la dieta de sus hijos:

61. Cuantos niños (menores de 18 años) hay en su casa? ______
62. ¿Tiene hijos?
- SÍ
- NO

Si su respuesta fue NO, pase a la pregunta 98

63. ¿Quién alimenta a los niños en su casa la mayor parte del tiempo?
- Ud
- Esposo
- Esposa
- Abuela
- Abuelo
- Otro (niñera, vecina, etc)

64. Quien alimenta a los niños de su casa mientras usted trabaja?
- Ud
- Esposo
- Esposa
- Abuela
- Abuelo
- Otro (niñera, vecina, etc)

65. Sus hijos toman el desayuno?
66. Si la respuesta fue SI, dónde toman generalmente el desayuno?
   - Casa ☐
   - Escuela ☐

67. Sus hijos comen con frecuencia comidas tradicionales preparadas en casa
   - SÍ ☐
   - NO ☐

68. ¿Con que frecuencia sus hijos ingieren comidas hechas en casa?
   - Cada día ☐
   - 4-6 veces/semana ☐
   - 2-3 veces/semana ☐
   - Una vez / semana ☐
   - Dos veces / mes ☐
   - Una vez / mes ☐

69. ¿Sus hijos comen alimentos preparados fuera del hogar?
   - SÍ ☐
   - NO ☐

70. Si la respuesta fue SI, ¿Cuántos días por semana?
   - 1 ☐
   - 2 ☐
   - 3 ☐
   - 4 ☐
   - 5 ☐
   - 6 ☐
   - 7 ☐

71. ¿Sus hijos comen la comida rápida (chatarra)?
   - SÍ ☐
   - NO ☐

72. Si la respuesta es SI, ¿Cuántos días por semana?
   - 1 ☐
   - 2 ☐
   - 3 ☐
   - 4 ☐
   - 5 ☐
   - 6 ☐
   - 7 ☐

Las preferencias de alimentos infantiles
73. Sus hijos prefieren comer comida chatarra (rápida) en lugar de comida tradicional casera?
   - SÍ ☐
   - NO ☐

74. Sus hijos prefieren dulces en lugar de comida tradicional casera?
   - SÍ ☐
   - NO ☐

75. Sus hijos prefieren bocadillos (golosinas) procesados en lugar de comida tradicional casera?
   - SÍ ☐
   - NO ☐

76. Sus hijos prefieren colas o gaseosas en lugar de agua y jugo?
   - SÍ ☐
   - NO ☐

Sistema alimentario
77. Usualmente dónde compra/obtiene sus alimentos? (indique todas las que apliquen):
   - Huerto casero _____
   - Huerto de los vecinos _____
   - Huerto comunitario _____
   - Mercado _____
   - Supermercado _____
   - Otro (especifique) ________

78. ¿Qué tan frecuente come alimentos cultivados en su huerto o el huerto de los vecinos?
   - Cada día ☐
   - 4-6 veces/semana ☐
   - 2-3 veces/semana ☐
   - Una vez / semana ☐
   - Dos veces / mes ☐
   - Una vez / mes ☐

Actividad física
79. En el último año, Usted ha comenzado a (eliжа una opción):
   - Más actividad física ☐
   - menos actividad física ☐
   - No he realizado actividad física ☐

80. En el último año, Usted pasa más tiempo sentado que caminando?
   - SÍ ☐
   - NO ☐

81. Usted hace ejercicio regularmente? ( a lo menos 3 veces/sem)
   - SÍ ☐
   - NO ☐

82. Cuantos horas cada semana hace ejercicio?
□1  □2  □3  □4  □5  □6  □7  □8  □9 o
más

**Occidentalización**
83. ¿Cuántas horas por día ve la televisión?
□1  □2  □3  □4  □5  □6  □7  □8  □9 o
más

84. ¿Cuántas horas al día pasa en el celular (mensajes de texto, juegos, whatsapp, etc.)?
□1  □2  □3  □4  □5  □6  □7  □8  □9 o
más

85. ¿Cuántas horas al día pasa en internet?
□1  □2  □3  □4  □5  □6  □7  □8  □9 o
más

86. Usted come mientras ve la televisión?
   SÍ □   NO □

87. Si su respuesta fue SI, indique que come y bebe mientras ve la televisión:

88. ¿Hay comidas, alimentos o bocadillos que usted come, porque los vió en la televisión?
   SÍ □   NO □

89. Sus hijos le piden que compre alimentos o bocadillos porque los ven en la televisión?
   SÍ □   NO □

**Estado de salud**
90. Alguien en su casa ha tenido enfermedades como cólera, diarrea, fiebre amarilla o dengue?
   SÍ □   NO □
   a. Si respondió sí, ¿cuántas personas en su casa, incluido usted, han sido diagnosticados con diabetes, presión arterial alta o enfermedades del corazón? __________

91. ¿Alguien de su familia ha sido diagnosticado de diabetes?
   SÍ □   NO □

92. Alguien de su familia ha sido diagnosticado de presión arterial alta?
   SÍ □   NO □

93. Alguien de su familia ha sido diagnosticado de enfermedad cardíaca?
   SÍ □   NO □

94. ¿Alguien en su hogar ha tenido un accidente cerebrovascular?
   SÍ □   NO □

95. ¿Usted ha sido diagnosticado de diabetes?
   SÍ □   NO □

96. ¿Usted ha sido diagnosticado de presión arterial alta?
   SÍ □   NO □

97. Se le ha diagnosticado de enfermedad cardíaca?
   SÍ □   NO □

98. ¿Alguna vez ha tenido un accidente cerebrovascular (derrame cerebral)?
   SÍ □   NO □

**La Salud dental**
99. Usted tiene caries?
   SÍ □   NO □

100. Cuantas caries? ______

101. ¿Tiene algunos dientes perdidos?
   SÍ □   NO □
   Si respondió sí, ¿cuántas dientes perdidos? ________
102. ¿Tiene algún diente flojo?
   SÍ ☐  NO ☐  
   Si respondió sí ¿cuántas dientes flojos? __________

103. ¿Tiene algún problema de masticar?
   SÍ ☐  NO ☐  

Personas para entrevistas
104. En su casa, quien decide lo que se come?
   ☐ Yo  ☐ Mi Esposa  ☐ Mi Esposo  ☐ Mi madre  ☐ Mi padre  ☐ Otra persona

Para ser llenado por el equipo:
Sexo: □ M  □ F  Edad: ________
Altura: ________ Peso: ________ IMC: ______ % de grasa corporal: ______
Circunferencia de cintura: ___________
ID # del participante en el estudio de Isabel: ________

Hola, mi nombre es Vanessa Chee y soy parte del grupo de trabajo del estudio de Isabel Hernández. Me gustaría poder hacer seguimiento y entender más sobre su dieta y la de su familia. Estoy recolectando esta información para mi tesis en la Universidad de Florida del Sur en Estados Unidos. Si Usted está interesado en hablar conmigo en persona, por favor indique su información de contacto y disponibilidad de tiempo a continuación:
Mi nombre es _________________________ y estoy interesado en hablar más acerca de nutrición y actividad física.
Teléfono: ________________________________________
Dirección: ________________________________________________________________
Email: ____________________________________________
La mejor hora para llamar es (marque todas las veces que podemos llamar):
☐ En las mañanas entre las 9 am y las 12 pm
☐ Por la tarde entre las 12 pm y las 5 pm
☐ Por la noche entre las 5 pm y las 8 pm
☐ En los fines de semana
Appendix G

English Informed Consent Form

Verbal Informed Consent
Study number: PR00029104

Researchers at the University of South Florida (USF) study many topics. To do this, we need the help of people who agree to take part in a research study. We are asking you to take part in a research study that is called: The nutrition transition among the Kichwas people of the Andes in Ecuador.

The person who is in charge of this research study is Vanessa Chee. This person is called the Principal Investigator.

This study is partly sponsored by: The University of South Florida

You are being asked to participate because you meet the study selection criteria. The purpose of this study is to explore the nutrition transition in the Kichwas community.

If you take part in this study, you will be asked to 1) Participate in an in-depth interview and 2) Allow the principal investigator to participate in the preparation of a meal for your family, 3) Participate in a verbally administered demographic form, or 4) Participate in an intercept interview. Both of these will take place at your home. The interview will be recorded while photos will be taken of you as you cook – others may also help you to cook if this is what is normally done in your home.

You have the alternative to choose not to participate in this research study and are welcome to stop the interview at any time. You should only take part in this study if you want to volunteer and should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study.
We are unsure if you will receive any benefits by taking part in this research study but it is possible that you will become more aware of your dietary choices and behaviors as a result of this study. This research is considered to be minimal risk. We will not pay you for the time you volunteer while being in this study.

We will keep your study records as confidential as possible. We may publish what we learn from this study. If we do, we will not let anyone know your name. We will not publish anything else that would let people know who you are. However, certain people may need to see your study records. By law, anyone who looks at your records must keep them completely confidential. The only people who will be allowed to see these records are:

• The research team, including the Principal Investigator, the Advising Professor, and all other research staff.
• Certain government and university people who need to know more about the study. For example, individuals who provide oversight on this study may need to look at your records. This is done to make sure that we are doing the study in the right way. They also need to make sure that we are protecting your rights and your safety.) These include:
  • The University of South Florida Institutional Review Board (IRB) and the staff that work for the IRB. Other individuals who work for USF that provide other kinds of oversight may also need to look at your records.
  • The Department of Health and Human Services (DHHS).
  • The College of Public Health at the University of South Florida

If you have any questions about this study, you can contact the investigator Vanessa Chee at 1-352-777-2455 or vachee@mail.usf.edu. If you have question about your rights as a research participant please contact the USF IRB at 813-974-5638.

Would you like to participate in this study?

Do you consent to audio recording and photos as part of this study?
Appendix H

Spanish informed consent form

CONSENTIMIENTO INFORMADO

Investigadores de la Universidad del Sur de Florida (USF) estudian muchos temas. Para hacer esto, necesitamos la ayuda de personas que acepten participar en un estudio de investigación. Le pedimos que participe en un estudio de investigación que se llama: La transición nutricional entre los Kichwas de los Andes en Ecuador.

La persona a cargo de este estudio de investigación es Vanessa Chee. Esta persona se llama Investigador Principal.

Este estudio está patrocinado en parte por: La Universidad del Sur de Florida

Se le solicita participar porque cumple con los criterios de selección del estudio. El propósito de este estudio es explorar la transición nutricional en la comunidad Kichwas.

Si participa en este estudio, se le pedirá que: 1) Participe en una entrevista en profundidad y 2) Permita que el investigador principal participe en la preparación de una comida para su familia, 3) Participe en un formulario demográfico administrado verbalmente, o 4) Participar en una entrevista de interceptación. Ambos se llevarán a cabo en su hogar. La entrevista se grabará mientras le saquen fotos mientras cocina; otras también pueden ayudarlo a cocinar si esto es lo que normalmente se hace en su hogar.

Tiene la alternativa de elegir no participar en este estudio de investigación y puede suspender la entrevista en cualquier momento. Solo debe participar en este estudio si desea ser voluntario y no debe sentir la presión de participar en él. el estudio. Usted es libre de participar en esta investigación o retirarse en cualquier momento. No habrá ninguna multa o pérdida de los beneficios que tiene derecho a recibir si deja de participar en este estudio.

No estamos seguros de si recibirá algún beneficio al participar en este estudio de investigación, pero es posible que se vuelva más consciente de sus elecciones y comportamientos dietéticos como resultado de este estudio. Esta investigación se considera de riesgo mínimo. No le pagaremos por el tiempo que se ofreció como voluntario mientras participa en este estudio.
Mantendremos sus registros de estudio tan confidenciales como sea posible. Podemos publicar lo que aprendemos de este estudio. Si lo hacemos, no dejaremos que nadie sepa tu nombre. No publicaremos nada más que permita que las personas sepan quién es usted. Sin embargo, es posible que algunas personas necesiten ver los registros de su estudio. Por ley, cualquiera que mire sus registros debe mantenerlos completamente confidenciales. Las únicas personas a las que se les permitirá ver estos registros son:

- El equipo de investigación, incluido el investigador principal, el profesor asesor y todo el resto del personal de investigación.
- Ciertas personas del gobierno y la universidad que necesitan saber más sobre el estudio. Por ejemplo, las personas que supervisan este estudio pueden necesitar revisar sus registros. Esto se hace para asegurarnos de que estamos haciendo el estudio de la manera correcta. También necesitan asegurarse de que estamos protegiendo sus derechos y su seguridad. Estos incluyen:
  - La Junta de Revisión Institucional (IRB) de la Universidad del Sur de Florida y el personal que trabaja para el IRB. Otras personas que trabajan para USF y que brindan otros tipos de supervisión también pueden necesitar revisar sus registros.
  - El Departamento de Salud y Servicios Humanos (DHHS).
  - La Facultad de Salud Pública de la Universidad del Sur de Florida

Si tiene alguna pregunta sobre este estudio, puede comunicarse con la investigadora Vanessa Chee al 1-352-777-2455 o a vachee@mail.usf.edu. Si tiene dudas sobre sus derechos como participante en la investigación, comuníquese con el USF IRB al 813-974-5638.

¿Te gustaría participar en este estudio?

¿Aceptas la grabación de audio y fotos como parte de este estudio?
### Appendix I

Bilingual Semi-structured Interview debriefing template

<table>
<thead>
<tr>
<th>1) Objetivo: Explorar las prácticas dietéticas del hogar</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Objective: Explore household dietary behavior</td>
</tr>
</tbody>
</table>

**La comida que comes**

The food that you eat

<table>
<thead>
<tr>
<th>a) La comida rápida</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast food</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b) Las comidas caseras tradicionales/ Traditional homemade meals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuantas veces: _____________________________ How many times a day: _____________________________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>c) &amp; d) Los alimentos procesados</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processed foods</td>
</tr>
</tbody>
</table>
2) Objetivo: Explorar los patrones de actividad física en individuos y hogares
La actividad física se considera el ejercicio que consigue su ritmo cardíaco para arriba.
A) Cuénteme acerca de la rutina de ejercicio con usted y su familia?

3) Objetivo: Explorar los efectos del empleo y la modernidad y la urbanización sobre la dieta y la actividad física
A) Algunas investigaciones dicen que trabajar fuera de la casa afecta cómo las familias comen. ¿Qué piensas sobre esto?
3) Objective: Explore the effects of employment, modernization and urbanization on diet and physical activity
   A) Some research says that working outside of the home affects how families eat. What do you think about this?

   A) ¿Cómo ha afectado su trabajo su capacidad para hacer ejercicio?
      How has your job affected your ability to exercise?

   B) ¿Cómo afecta su trabajo la dieta de su familia?
      How does your job affect the family diet?

4) Objetivo: Tradiciones locales, creencias, prácticas dietéticas históricas versus tendencias actuales, influencia de la pérdida de identidad y modernización en la adquisición y preparación de alimentos
   A) ¿Puede compartir un poco acerca de las costumbres alimentarias locales?

4) Objective: Local traditions, beliefs, historical dietary traditions versus current practices, influence of the loss of identity and urbanization on meal shopping and preparation.
   A) Can you share a little about local dietary customs?
5) Objetivo: Explorar las diferencias entre generaciones
A) ¿Hay diferencias entre lo que usted y sus padres y/o los niños comen? Si hay diferencias, ¿por qué existen estas diferencias y cómo afectan a lo que su familia come en general?

5) Objective: Explore intergenerational differences
A) Are there differences between how you and your parents eat or you and your children? If there are differences, why do they exist and how do they affect how the family eats in general?

6) Objetivo: Efectos del acceso y utilización de la tecnología sobre la dieta y la actividad física
A) ¿Cómo afecta la tecnología (internet, cable, los teléfonos inteligentes) el estilo de vida de su familia?

6) Objective: Effects of technology access and utilization on diet and physical activity
A) How do cable, internet and smartphones affect the family’s lifestyle?

B) ¿Cómo afectan los anuncios de alimentos a su estilo de vida?
   How do TV ads for food affect what you eat?
7) Objetivo: Explorar el impacto de los roles de género en la dieta de los hogares
a. Háblame de la compra de alimentos en tu casa.

7) Objective: Explore the impact of gender roles on household dietary behavior
a. Tell me about food shopping in your home.

8. Enfermedades crónicas
   Chronic diseases
Appendix J

IRB Approval Letter - Ecuador

Quito, December 01, 2016

Isabel Hernández, PHD.
Principal Investigator
Pontificia Universidad Católica del Ecuador
Quito, Ecuador

To Whom It May Concern:

On behalf of the Universidad San Francisco de Quito’s Institutional Review Board for investigations involving human subjects (IRB), it is my pleasure to inform you that your request for revision and approval of the study entitled, "IDENTIFICATION OF PROTECTIVE FACTORS AGAINST METABOLIC SYNDROME IN INDIGENOUS POPULATION OF THE NORTH OF ECUADOR DURING 2016-2017" has been approved today as an expedited study, given that the study will collect personal data but the investigator assures that they will be coded for analysis and the presentation of the results and that all potentially identifying information will be erased upon the study’s conclusion.

The USFQ IRB approves this study given that it complies with the following parameters:

- The investigative project shows goals and/or objectives of scientific significance with a justification and references.
- The research protocol includes procedures to minimize the risks to participants and/or the risks are reasonable in relation to the anticipated benefits of the study.
- The study participants have a right to withdraw from the study and their participation was obtained through informed consent.
- The protocol includes provisions to protect the privacy and confidentiality of the study participants in the data collection, analysis, and storage phases of the project.
- The protocol details the investigators’ responsibilities.

Additionally, the principal investigator of this study has responded to the questions raised by USFQ’s IRB and has modified the application accordingly throughout several revisions. The documents that are approved as the outline to this study constitute the third revision (version #3), received by USFQ’s IRB on November 30, 2016, and includes:

Casilla Postal 17-12-804, Quito, Ecuador
• Request for review and approval of an investigative study, 28 pages
• Request for application to written informed consent, ethnography component, 2 pages;
• Request for application to written informed consent, genomic component, 3 pages;
• Request for application to written informed consent request, 3 pages;
• Curriculum vitae of the principal investigator.

This approval has a duration of 1 year (365 days), after which an extension for the study should be solicited if necessary. In all future correspondence with USCQI’s IRB please refer to this study by the following code: 2016-1271N. Throughout the duration of this study, USCQI’s IRB is prepared to respond to all questions raised by investigators as well as participants.

Please take note of the following points related to the responsibilities of the investigator to USCQI’s IRB:

1. The IRB is not responsible for the data collected before the date of this letter; data collected before the date of this article cannot be published or included in results.
2. The IRB has granted the present approval based on the information provided by the applicants, who, by presenting their application, declare the truthfulness, correctness, responsibility, and authorship of the above-listed documents.
3. In the same way, the applicants for approval are responsible for the correct and ethical execution of the investigation, respecting the documents and conditions approved by the IRB, according to the current applicable laws, national standards, and international standards governing this area.

We wish you the best success in your study. It is requested that the investigators notify the IRB of the end date of their study.

Respectfully,

William F. Waters, PhD
President of USCQI’s IRB
Cc. General Archive, Archive protocol
Appendix K

USF IRB Approval Letter

June 14, 2017

Vanessa Chee
Community and Family Health
13303 Bruce B. Downs Blvd
MHC2331
Tampa, FL 33613

RE: Expedited Approval for Initial Review
IRB#: Pro00029104
Title: The nutrition transition among the Kichwas indigenous community in Ecuador

Study Approval Period: 6/13/2017 to 6/13/2018

Dear Ms. Chee:

On 6/13/2017, the Institutional Review Board (IRB) reviewed and APPROVED the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Nutrition Transition Indigenous study protocol v1_6.8.17.docx

Consent/Assent Document(s):
Consentimiento Informado Verbal V1_6.5.17.docx
Informed Consent form v1_6.5.17.docx

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved. Verbal Consent forms are not stamped.

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110. The research
proposed in this study is categorized under the following expedited review category:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your study qualifies for a waiver of the requirements for the documentation of informed consent as outlined in the federal regulations at 45CFR46.117(c) which states that an IRB may waive the requirement for the investigator to obtain a signed consent form for some or all subjects if it finds either: (1) That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject's wishes will govern, or (2) That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context. (Verbal consents)

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) calendar days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continuing commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

John Schinka, Ph.D., Chairperson
USF Institutional Review Board
Appendix L

Revised Nutrition Transition Questionnaire

<table>
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<th>MD (Item)</th>
<th>Int’l (Item)</th>
<th>USA (Item)</th>
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</tbody>
</table>

Key:
- ✓ PhD: Item is appropriate to the interests of a social science researcher
- ✓ MD: Item is appropriate to the interests of a nutritionist or physician seeking to treat patients by identifying lifestyle risk behaviors related to the chronic disease risk
- ✓ Int’l: Item is appropriate for investigation in international settings, in lower and middle-income countries
- ✓ USA: Item is appropriate for investigation in the United States, Europe, and other high-income countries

Items may be appropriate to several areas of investigation simultaneously.

This checkerboard system is intended to form the basis of instrument adaptation that takes into account cultural context and the purpose for which this lifestyle assessment is gathered, either clinical or research purposes.
<table>
<thead>
<tr>
<th>Category</th>
<th>Question</th>
<th>Options</th>
<th>PhD</th>
<th>MD</th>
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<td>6 7</td>
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<table>
<thead>
<tr>
<th>Physical activity &amp; Sedentary lifestyle</th>
<th>How many days do you walk or bicycle, either as exercise or as a way of getting around?</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7</td>
<td>0=0 1=1 2=2 3=3 4=4 5=5 6=6 7=7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical activity &amp; Sedentary lifestyle</th>
<th>How many days do you walk or bicycle, either as exercise or as a way of getting around?</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7 or more</td>
<td>0=0 1=1 2=2 3=3 4=4 5=5 6=6 7=7 or more</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technology utilization</th>
<th>How many hours do you sit and watch tv per day?</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7 or more</td>
<td>0=0 1=1 2=2 3=3 4=4 5=5 6=6 7=7 or more</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technology utilization</th>
<th>How many hours do you spend on the computer/internet per day?</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7 or more</td>
<td>0=0 1=1 2=2 3=3 4=4 5=5 6=6 7=7 or more</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technology utilization</th>
<th>How many times do you use your smart phone per hour?</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2 3 4 5 6 7 or more</td>
<td>0=0 1=1 2=2 3=3 4=4 5=5 6=6 7=7 or more</td>
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<table>
<thead>
<tr>
<th>Transportation</th>
<th>How many days do you</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 1 2</td>
<td>0=0 1=1 2=2</td>
</tr>
<tr>
<td>Drive a vehicle each week?</td>
<td>0: 3 4 5 6 7</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------</td>
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<tr>
<td>Urbanization</td>
<td>0: 0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Food as reward</td>
<td>0: 0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>Food choices</td>
<td>What you have Restaurant nearby Grocery items on sale</td>
</tr>
<tr>
<td>Food Sources</td>
<td>Grocery Market Garden Fast food chain Street food Restaurant</td>
</tr>
<tr>
<td>Dual income</td>
<td>Yes No</td>
</tr>
<tr>
<td>Primary child care</td>
<td>Yes No</td>
</tr>
<tr>
<td>RESILIENCE DOMAINS</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td></td>
</tr>
<tr>
<td>Fermented foods</td>
<td>How many days each week do you eat fermented foods like yogurt or vinegary foods like pickles, sauerkraut, kimchi?</td>
</tr>
<tr>
<td></td>
<td>□ 0  □ 1  □ 2  □ 3  □ 4  □ 5  □ 6  □ 7</td>
</tr>
<tr>
<td>Grass fed Butter</td>
<td>How many days each week do you eat grass fed butter?</td>
</tr>
<tr>
<td></td>
<td>□ 0  □ 1  □ 2  □ 3  □ 4  □ 5  □ 6  □ 7</td>
</tr>
<tr>
<td>Fresh fish</td>
<td>How many days each week do you eat fresh fish?</td>
</tr>
<tr>
<td></td>
<td>□ 0  □ 1  □ 2  □ 3  □ 4  □ 5  □ 6  □ 7</td>
</tr>
<tr>
<td>Grass fed meat</td>
<td>How many days each week do you eat grass fed meat?</td>
</tr>
<tr>
<td></td>
<td>□ 0  □ 1  □ 2  □ 3  □ 4  □ 5  □ 6  □ 7</td>
</tr>
<tr>
<td>Fruits</td>
<td>How many days each week do you eat at least one serving of fresh fruits?</td>
</tr>
<tr>
<td></td>
<td>□ 0  □ 1  □ 2  □ 3  □ 4  □ 5  □ 6  □ 7</td>
</tr>
<tr>
<td>Vegetables</td>
<td>How many days each week do you eat at least one serving of vegetables?</td>
</tr>
<tr>
<td></td>
<td>□ 0  □ 1  □ 2  □ 3  □ 4  □ 5  □ 6  □ 7</td>
</tr>
<tr>
<td>Category</td>
<td>Question</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Raw food</td>
<td>How many days each week do you eat raw fruits or vegetables?</td>
</tr>
<tr>
<td>Salads/Greens</td>
<td>How many days each week do you eat salads or dark leafy greens?</td>
</tr>
<tr>
<td>Organic</td>
<td>How many days each week do you eat organic food?</td>
</tr>
<tr>
<td>Non-GMO</td>
<td>How many days each week do you eat Non-GMO food?</td>
</tr>
<tr>
<td>Plate proximity (to earth)</td>
<td>How many days each week do you eat produce that you, a friend or neighbor picked from a garden?</td>
</tr>
<tr>
<td>Plate proximity (to earth)</td>
<td>Do you fish?</td>
</tr>
<tr>
<td>Plate proximity (to earth)</td>
<td>Do you raise your own cattle, pigs, poultry?</td>
</tr>
<tr>
<td>Plate proximity (to earth)</td>
<td>On a scale of 0-7, 7 being the food that was picked or slaughtered just before you ate it, 0 being mainly boxes,</td>
</tr>
<tr>
<td></td>
<td>How many days each week do you eat traditional meals?</td>
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<td>-----------------------</td>
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</tr>
<tr>
<td><strong>Traditional meals</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>How many days each week do you eat home-cooked meals</td>
</tr>
<tr>
<td></td>
<td>(i.e. meals made from scratch without pre-packaged</td>
</tr>
<tr>
<td></td>
<td>items)?</td>
</tr>
<tr>
<td><strong>Home-made meals</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>How many days each week does your family/household</td>
</tr>
<tr>
<td></td>
<td>eat together?</td>
</tr>
<tr>
<td><strong>Family meals</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>How many days each week does your family cook together?</td>
</tr>
<tr>
<td>DISEASE DOMAINS</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td></td>
</tr>
<tr>
<td><strong>Chronic disease</strong></td>
<td>Have you ever been diagnosed with type 2 diabetes, heart disease, stroke, high cholesterol, high blood pressure? Please indicate which apply to you.</td>
</tr>
<tr>
<td><strong>Yes</strong></td>
<td><strong>No</strong></td>
</tr>
<tr>
<td>Yes=1</td>
<td>No=0</td>
</tr>
<tr>
<td><strong>Chronic disease</strong></td>
<td>Have you or anyone in your family ever been diagnosed with any form of cancer?</td>
</tr>
<tr>
<td><strong>Yes</strong></td>
<td><strong>No</strong></td>
</tr>
<tr>
<td><strong>Oral Health</strong></td>
<td>Do you have loose teeth, cavities, dentures, extractions, or problems chewing? Please indicate which apply to you.</td>
</tr>
<tr>
<td><strong>Yes</strong></td>
<td><strong>No</strong></td>
</tr>
<tr>
<td>Yes=1</td>
<td>No=0</td>
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</tbody>
</table>