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The Effects of Food Insecurity on Mental Wellbeing in Monteverde Costa Rica

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The Effects of Food Insecurity on Mental Wellbeing in Monteverde Costa Rica

by

Robert Eugene Cowherd

Thesis submitted to the Faculty of the
College of Arts and Sciences, Department of Anthropology
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the degree of MASTERS OF ARTS
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Figure 16 shows a map of the study area and the food security status of the participants’ households..........................................................112
Preface

I began piloting the research for this thesis in the summer before my actual fieldwork began. I was still finishing my graduate course work at the University of South Florida, and taking the Globalization and Community Health summer field school in the Monteverde zone of Costa Rica. The course was held in the beautiful Tilarán Mountains, and conducted through a partnership of faculty from USF’s Department of Anthropology and the staff at the Monteverde Institute. The course was designed to give students a hands-on education in research design, data analysis, and field methodology. We were assigned to research teams based on common research interests and given topics to explore that were relevant to life in Monteverde. My team focused on local concepts of stress and common stressors specific to the Monteverde community. It was a small project that produced some interesting insights and stimulated my interest in the anthropology of stress and nutrition. During the following year, I developed a more robust study aimed at exploring how the rapidly changing economic and food environment in the three towns in the Monteverde zone were effecting overall mental wellbeing. The work contained herein is the result of that study. Data were collected over nearly five months of fieldwork which was split up during the summers of 2010 and 2011. All fieldwork was conducted in the Monteverde zone, and was made possible by a Research Experience for Graduate Students (REG) grant from the National Science Foundation. This grant was a supplementary grant to a larger, longitudinal grant entitled...
The Impact of Economic Change on Food Habits and Nutritional Health in Monteverde, Costa Rica: Mixing Food Production and Tourism (Himmelgreen (PI), NSF #BNS 0753017) from the National Science Foundation.

I am greatly indebted to the faculty and staff at the University of South Florida and the staff at the Instituto Monteverde, without whom none of these efforts would have been possible. I would specifically like to thank Jenny Peña and Ernesto Ruiz (USF doctoral student) at the Instituto Monteverde for their support and guidance; David Himmelgreen (major advisor), Daniel Lende (co-major advisor) and Nancy Romero-Daza (committee member) at the University of South Florida for their intellectual guidance and mentorship; and my foremost intellectual critic, helpmate and wife, Jennifer, for her unwavering support in this pursuit.
Abstract

The rapid expansion of ecotourism in the Monteverde zone of Costa Rica has increased the incidence in food insecurity in the area. Changes in food preferences and availability have led to a more homogenized diet that is increasingly delocalized and reliant on processed foods. Additionally, there has been a rapid economic shift away from agricultural and dairy farming to an economy more reliant on tourism. This NSF supported study builds upon data from a longitudinal investigation (#BNS 0753017) examining the nutritional effects of this rapid economic transition. Using a mixed methods approach, a culturally appropriate scale of stress was developed and used in conjunction with the Household Food Insecurity Access Scale, the Cohen Perceived Stress Scale, and the Hopkins Symptom Check List to explore the relationship between food insecurity and mental health among residents of the Monteverde zone. Quantitative results show that food insecurity correlated positively with stress, depression and anxiety, and was found to be a significant predictor of stress and depression
Chapter 1: Introduction

Introduction

The central assertion of this work is that human beings are inherently biosocial creatures. I borrow from Jablonka and Lamb (2005) and Goodman and Leatherman's (1998) position that all human biology is a socialized biology – the result of a historically received epigenetic “signal” that has been shaped throughout our evolutionary past by social, environmental, and biological constraints. In this view, the concept of heredity is expanded upon to include not only genes, but also the historical record of social and environmental factors encoded along with the genetic information in our DNA. This coding comes in the form of individual genes being turned off and on in response to key events in our developmental history (Benyshek 2005; Jablonka and Lamb 2005). Thus, human evolution is a multidimensional process that involves a complex interaction of genetic, epigenetic, environmental, political economic, behavioral, and symbolic factors that provide the raw material upon which natural selection can act (Jablonka and Lamb 2005).

Stress, depression, and anxiety represent three distinct, yet overlapping aspects of mental well being — defined as the subjective perceptions and evaluations an individual develops of their own lives in terms of their affective states and their psychological and social functioning (Keyes 2002) — and are linked to many of the same health outcomes as nutritional and dietary factors (Dallman, et al. 2003; Glaser and Kiecolt-Glaser 1994;
McEwen 2000). For example, the American Center for Disease Control (CDC 2012) lists high cholesterol, high blood pressure, diabetes, cigarette smoking, overweight and obesity, poor diet, physical inactivity and alcohol use as the top ten risk factors for cardiovascular disease. The symptoms of stress and depression are characterized by feeling low in energy and periods of physical inactivity and can contribute to cardiovascular risk factors if this behavior is prolonged (Derogatis 1974). Additionally, Dallman and colleagues (2003) have shown that “comfort eating”, the act of consuming high calorie, high fat foods, can temporarily suspend the body’s stress response and alleviate these symptoms. Finally, prolonged stress has been shown to inhibit the uptake of sugar from the blood, increase the amount of white blood cells and the clotting agent fibrinogen in the bloodstream. These two factors thicken the blood, making it more susceptible to arterial blockages (McEwen 1998). Thus, the effects of stress contribute to cardiovascular disease risk factors via both behavioral and nutritional pathways.

Likewise, there is a growing corpus of literature linking fetal health outcomes to maternal nutritional and mental distress during pregnancy (Barker 2001; Benyshek 2005; Kuzawa and Pike 2005). In 2005, Benyshek proposed that the absence of specific micronutrients in the maternal diet was an additional factor in determining small for gestational age (SGA) infants, a factor that increases the risk for cardiovascular disease, diabetes and hypertension later in life.

The physical health effects of food insecurity are substantial and well documented, but the effects of food insecurity on mental wellbeing remain largely unexplored (Weaver and Hadley 2009). As chronic stress and food insecurity share many of the same negative health outcomes, the full health effects of food insecurity remain
largely unknown. This study combines ethnographic research and quantitative measures of stress, depression, and anxiety to examine the effects of food insecurity on mental health in the Monteverde zone of Costa Rica.

Statement of the Problem

The concept of globalization denotes an encroaching interconnectivity among people across the globe facilitated by improvements in communications technology, advances in transportation, and increased transnational and international trade. It is characterized by a structural shift away from a localized economy and an increased interdependence among discrete nations that accelerates over time (Held and McGrew 2007). As Wolf (1982) explained, this process has intensified worldwide political economic and social relations in such a way that very distant events can acquire very localized impacts, and vice versa (Wolf 1982). While there are benefits to globalization, such as increased economic opportunity, free trade markets, and advances in medical technology, these benefits are often assessed via economic measures that mask the corresponding social and health burdens borne by local communities. These include increased income differentials that widen the gap between the rich and the poor, structural inequalities, and the spread of infectious and noncommunicable diseases (Cilingiroglu 2005). While decreases in infectious disease are among the benefits resulting from this shift (Held and McGrew 2007), there are also documented increases in diet-related and noncommunicable diseases corresponding with globalization that have been documented in Costa Rica and other Latin American countries (Armelagos, et al.
Over the past two decades, the Monteverde zone of Costa Rica has been in a process of rapid economic transition as the region’s economic base has shifted away from agriculture to a mixed agricultural/tourism economy. The tourism industry has seen its most significant growth in the past 10 years, bringing with it an influx of foreign currency into the region and increasing the buying power of many local residents. However, there has also been a corresponding increase in incidence of overweight, obesity, hypertension, and cardiovascular disease over the past 10 years (Himmelgreen, et al. 2006).

Food insecurity has also increased in the zone as a result of this economic shift. Food security is defined by the Food and Agriculture Organization of the United Nations (FAO) (FAO) as “a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO 1996:28). Thus, food insecurity exists when any of the above criteria are threatened. Food Insecurity (FI) has been linked to a number of diet related, noncommunicable diseases including overweight and obesity (Crawford and Webb 2011; Dumke 2005; Lofton 2005; Stuff, et al. 2004), and has increased in the region as a result of the economic transition to tourism (Himmelgreen 2006). Studies conducted in the last 15 years have documented a rise in childhood overweight and obesity (Nunez-Rivas, et al. 2003), and an increase in cardiovascular disease and myocardial infarction (Araya and Padilla 2004). These studies suggest that Costa Rica is experiencing an epidemiological and nutritional transition away from communicable diseases to non-communicable and diet-related
diseases. Recent studies have shown that these changes stem from economic changes that occur in response to globalization: changes in the availability of food, rising food costs, increased socioeconomic inequality, and the increased reliance upon processed foods have had a negative affect on the food security status and nutritional health of residents in the Monteverde Zone (Himmelgreen, et al. 2006). Research into FI and mental wellbeing has shown an association between FI and stress, depression, anxiety, and worry (Bronte-Tinkew, et al. 2007; Hadley and Patil; Laraia, et al. 2006; Lofton 2005; Whitaker, et al. 2006), which have likewise been linked to many of the same non-communicable diseases as food insecurity. This research suggests that FI is a social problem with psychological, nutritional, and biological consequences. This cross-sectional study examines the association between food insecurity and mental health of residents living in the Monteverde zone of Costa Rica. In doing so, an assessment of food insecurity and mental health is done. Additionally, this study attempts to identify salient and culturally based stressors in an effort to better understand the relationship between food insecurity and mental health in the context of globalization and related economic transformations in the zone.

Study Aims and Research Design

This study utilizes and builds upon an existing corpus of data from an ongoing NSF-funded longitudinal study (Himmelgreen, Romero-Daza, Wilkins, #BCS 0753017) on the impacts of globalization on the nutritional health and food security status of local residents of the Monteverde zone of Northwest Costa Rica. As stated, depression, anxiety, and worry accompany food insecurity and strained economic conditions (Bronte-
Therefore this study aims to: 1) examine how people perceive and define stress, depression, anxiety, and worry; (2) examine whether there is an association between perceived stress, anxiety, and depression related to FI; and (3) create maps showing clusters of household FI using spatial analysis and GIS technology that will provide information for the design and implementation of needed interventions. The findings of this study will contribute to our understanding of the relationship between FI and mental health, an area of research that is currently understudied (Bronte-Tinkew, et al. 2007; Stuff, et al. 2004; Tucker 2005; Weaver and Hadley 2009).

A mixed methods approach was used to collect psychometric and ethnographic data to gain an understanding of how food insecurity affects mental wellbeing. Qualitative data consists of ethnographic interviews, focus groups, and in-depth interviews to identify local stressors and perceptions of stress. Quantitative data consists of psychometric assessments to determine overall levels of stress, depression, and anxiety; the Household Food Insecurity Access Scale to assess household FI status; and the 30-Day Stress Scale, a scale designed by the researcher based on the results from the focus group data. Qualitative analysis was used to identify salient local stressors related to FI and local perceptions of stress, anxiety, and depression. Linear regression was used to determine the statistical relationship between FI-related stress and mental health, and spatial analysis was used to identify clusters of high levels of FI, depression, anxiety, and stress.
Theoretical Perspective

Anthropology has contributed much to our understanding of how global political economic forces contribute to food insecurity by constraining physical and economic access to safe and nutritious foods at the local level. Anthropological perspectives on food insecurity have used ethnographic accounts to inform biological and nutritional literature to offer more robust understanding of how the expanding global free trade market is impacting the health of local communities. Yet while much is known about how food insecurity affects health via nutritional pathways, its effects on mental wellbeing remain largely unexplored (Hadley and Patil 2008). Further, many anthropological studies on the negative health effects of stress have borrowed uncritically their theories of stress from clinical psychology. These views are rooted in a mind-body dualism that separates the psychological and biological systems from each other and from the events in the world (Lazarus 1982). In this view, events occur in the world and are neutral until the individual perceives them as either benign or threatening. The mind, perceiving a threatening event, reacts by setting off a chain of chemical events to prepare the body for action. The symptoms resulting from this process can be measured and have formed the basis for many of psychological and biological studies on stress, (Derogatis, et al. 1974; Glaser and Kiecolt-Glaser 1994; Ice and James 2007b; Lazarus 1993a).

Anthropological approaches to stress have traditionally borrowed uncritically from these paradigms and have relied on symptom checklists of mental wellbeing (Derogatis, et al. 1974) or changes in perceptions resulting from stress (Cohen, et al. 1995) rather than developing new methodologies and contributing to anthropological
perspectives on stress and perception. While traditional psychometrics are widely used for their ability to detect general stress, depression, and anxiety, their reliance on outcome variables does not allow the researcher to assess the cause of stress. Thus, the effect of FI on mental health may be confounded by other salient factors, such as rapid economic change and job scarcity. This study attempts to address this methodological gap by combining a phenomenological approach to stress with political economic perspectives to identify how experiences related to culturally salient stressors and food purchasing experiences become embodied. This approach, called dialectical-structuralism (Csordas 2002) collapses the mind-body dualism by focusing on embodied experience as a means of articulating how political economic change is experienced socially, mentally, and physically. In this view, historical experiences and encultured beliefs interact with psychology and biology to shape perceptions of an event. These perceptions then in turn motivate biological responses and coping behavior that then feedback into the system to reinforce and reproduce these pathways.
Chapter 2: Literature Review

Food insecurity, nutritional health, and mental health

Food insecurity (FI) is a growing problem in many populations worldwide. According to a recent report by the Food and Agriculture Organization (FAO), despite massive global efforts, there has been “virtually no progress” made in improving the food security status of the estimated one billion food insecure people worldwide (FAO 2009). Food insecurity is defined as a state in which people’s physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life becomes threatened (von Braun 2008) and has been linked to numerous deleterious health outcomes that affect both the mind and body. FI results in both undernutrition and overnutrition (a caloric excess combined with nutrient deficiency or imbalance) and has been recognized as causal factor in diet-related, noncommunicable diseases, including overweight and obesity (Adams, et al. 2003; Buscemi, et al. 2011; Crawford and Webb 2011) hypoglycemia in diabetics (Candib 2007; Nelson, et al. 2001) and cardiovascular diseases (FAO 2008). FI has implications for infectious diseases as well. In what is now described as the nutrition-infection complex, Chandra (1997) showed how food insecurity compromises the immune system at the cellular level via micronutrient deficiencies. Scrimshaw and San Giovanni (1997) showed how this synergism of malnutrition and compromised immunity works to impair
resistance to infectious diseases and increases epidemiological risk factors in affected populations, creating a downward spiral where the already weakened body takes on an increased load fighting the disease. A clear example of this interaction of nutrition and infectious disease can be seen in the HIV/AIDS pandemic in resource-poor nations: nutritionally deficient diets give way to compromised immunity, increasing the risk for contracting HIV and hastening the onset of full blown AIDS (Himmelgreen, et al. 2009).

The effects of FI on mental wellbeing have been recorded in ethnographic literature for some time. For example, Howard and Miller (1997) who have presented a gripping account of the despair, shame and social stigma that add insult to injury as parents struggle to feed their children recount case after case where severely malnourished children living in the Kilimanjaro, region of northeastern Tanzania are ostracized from the village. Children in advanced stages of malnutrition, they note, are segregated from the other children because of their flakey hair, discolored skin, distended bellies, and puffy face. They recoil from their mother’s touch because of their swollen and sore ridden bodies, and are avoided by other villagers because of the foul odor that comes as a result of the chronic diarrhea that is indicative of advanced malnutrition. The authors report how the mothers of these children loose self confidence and social prestige, causing then to restrain their affections toward the child, and how the children, even in their weakened state, seem to sense the lack of support and withdraw even further. Scheper-Hughes (1992) documents the impact that hunger and hunger-related death has on the mother-child relationship in impoverished favelas in Brazil. In what she described as “delírio de fome — the madness of hunger” (Scheper-Hughes 1992) she records an account of a mother who had murdered her two children “to stop them from crying for
milk” (pg. 128), and recounts how an informant explained to her that this was an all too common act in the favelas, “good people being driven to commit acts for which they would later repent” (Scheper-Hughes 1992:4).

FI has been correlated with strained economic conditions (Bronte-Tinkew, et al. 2007) and increased incidences of depression, anxiety, and stress (Hadley and Patil 2008). Other studies show that an inability for a parent to provide the types of food their family desires or enough food to feed their families on a consistent basis has been shown to cause depression, stress and anxiety in the parents (Becquey, et al. 2010; Bronte-Tinkew, et al. 2007; Coates, et al. 2006; Hadley and Patil 2008). Still others (Achenbach and Edelbrock 1981; Connell, et al. 2005; Whitaker, et al. 2006), have shown that food insecurity can have secondary psychological effects on children in a household. For example, Whitaker and colleagues (2006) used the US Household Food Security Survey Module to assess household food security in conjunction with the Composite International Diagnostic Interview – Short Form to assess depression and anxiety in mothers, and the Child Behavior Checklist to assess child behavior problems. In a 2,870 member sample of mothers of three-year old children in 18 large US cities, their results showed an increase in general anxiety disorder and depression among mothers in the food insecure households, as well as a significant increase in child behavioral problems in those households. These results show that while children may be nutritionally buffered from the effects of reduced food availability by their parents, the children still experience a secondary psychological impact as the stress, depression, and anxiety experienced by their parents affects their relationship.
The Political economy of food insecurity

There has been increasing evidence over the past two decades in support of a link between rapid changes in local economies and significant changes in overall health and nutritional status. Studies focusing on the impact of tourism on local dietary patterns and nutritional diversity have noted significant changes in dietary diversity and nutritional quality in these populations as a result of engaging in a free market economy (REFS).

While there are benefits to engaging in the global market economy, such as bolstered household incomes and access to health services (Himmelgreen, et al. 2006), there is also a corresponding rise in diet-related, noncommunicable diseases that are often overlooked in light of the more positive aspects. Cardiovascular disease, type-two diabetes, hypertension, stroke and obesity are nearing epidemic proportions in economically developing nations, and it is becoming increasingly clear that these epidemiological trends are linked to the broader political economic trends (Adams, et al. 2003; Buscemi, et al. 2011; Casey, et al. 2006; Popkin 2002; Popkin and Gordon-Larsen 2004).

A review of the literature shows that there are a number of factors related to this shift in the modes of production that lead to declines in nutritional health and food security status. These factors can be thought of as falling into two separate but overlapping domains. The first domain, what I will refer to as the material domain, consists of structural or materialist factors that constrain economic and physical access to food. These factors are well substantiated in the literature and include the introduction of labor saving technologies and telecommunications that allow more time for leisure activities (Groeneveld and Solomons 2007; Popkin 2002; Whiting and Ward 2010), increased work and social demands that leave less time for meal preparation and
consumption, shifting away from local food production to an international system of food commodities (Himmelgreen, et al. 2006), and low paying wages in the tourist industry combined with rising food costs (Himmelgreen, et al. 2006; Leatherman and Goodman 2005; Weingartner 2008). These factors work in concert to create an increasingly homogenized diet that is more reliant upon prepackaged and processed foods that are high in fat and low in complex carbohydrates (Casey, et al. 2006; Crawford and Webb 2011; Tanumihardjo and Anderson 2007). In some cases the influx of capital brought by the tourism industry translates into a more diverse and higher quality diet; however, there is also clear evidence showing that the accompanying dietary and lifestyle shifts have a negative impact on the nutritional and mental health of many populations worldwide. In these communities, decreases in agricultural activity and in the availability of locally produced foods result in an increased reliance upon imported foods that leads to a less diverse diet that is lower in nutritional quality (Himmelgreen, et al. 2006; Weingartner 2008).

For example, Leatherman and Goodman (2005) have documented how materialist factors have affected food security status and the nutritional health of Mayan communities in Mexico’s Yucatan Peninsula. Over the past forty years, the social and economic conditions of several Yucatec Mayan communities have been transformed from an economically marginalized area to one of the most popular eco-tourist and archaeo-tourist destinations in the Yucatan Peninsula. While this industry has brought opportunity for economic advancement for some, it has also disrupted local subsistence activities. In order to support the massive tourism infrastructure, an increasing number of small-scale producers are abandoning their subsistence farming and turning to low paying wage-labor
jobs in the tourist industry. As time and labor once allocated to agricultural production has been redirected to fill jobs in the tourist industry, local food production has decreased, delocalizing diets upon store-bought foods. Store-bought fresh meat, fruits and vegetables are comparatively expensive commodities for local residents, many of whom live below the U.S. poverty level. Additionally, the increased demands of the tourist labor market leave less time available for food preparation and consumption and contribute to a greater consumption of prepackaged, commercially processed foods that are calorie dense but nutritionally poor. This confluence of factors has contributed significantly to the growing incidence of overweight and obesity in Yucatec Maya adults, and growth stunting in children (Leatherman and Goodman 2005).

A similar phenomenon has been documented in the Monteverde zone, Costa Rica. Himmelgreen and colleagues (2006), who have extensively studied the impact of economic change on the food security status and nutritional health of Monteverde residents, have noted a similar pattern where the growing tourist industry has caused increases in overweight and obesity and FI. In a study comparing women from two rural communities in Costa Rica, both undergoing the transition from an agricultural economy to tourism, they found a high prevalence of FI in both towns, despite significant socioeconomic differences. Prevalence rates ranged from 67% in the agricultural community to 76% in the tourist community. Ethnographic data showed that as jobs in the tourism sector became popular, less time was available for agriculture and dairy farming. This increased their reliance on store-bought foods. Compounding the issue of food insecurity in the Monteverde zone is the inflation of food prices during the peak tourism season. Food prices rise to meet demand during the peak tourist season, but do
not subside during the off-season when there is less business and household incomes are lower. Their research shows that the incongruency between rising food prices and fluctuating income is the leading cause of food insecurity in the area (Himmelgreen, et al. 2006).

The second domain, what I will refer to as the ideational domain, consists of the symbolic and ideological factors that influence dietary patterns and lifestyle behavior that change as a result of increased contact with westerners and western commercial products. Psychosocial aspects, such as peer and parental influences shape perceptions of what foods are desirable, how certain foods are prepared, consumption behaviors (Monge-Rojas, et al. 2002), and food preparation roles (Preston-Werner 2008). Also included in this category is the role that commercial marketing campaigns have in shaping food preferences and consumption patterns (Harris, et al. 2009; Schor and Ford 2007).

In response to rising rates of adolescent overweight and obesity among Costa Rican adolescents, Monge-Rojas and colleagues (2002) designed a study to examine the psychosocial aspects of adolescent eating and physical activity patterns. They noted that as lifestyle habits, such as food preferences, preparation practices, and physical activity patterns are established during childhood and adolescence, there was a lack of data documenting how increased exposure to western foods and life style patterns were affecting behavior and health. They examined the role that five psychosocial domains (peer influence, parental influence, influence of the social environment, self efficacy, and influence of non-verbal communication such as body language) played in shaping dietary and physical activity patterns. Their results showed that peer opinions played the largest role in predicting the intake of foods high in saturated fat and carbohydrates, while
parental influences played the largest role in predicting the intake of fruits and vegetables. Their findings also showed that adolescents spent more time with peers than with families, which increased the amount of time adolescents spent consuming high fat foods. This study also noted how adolescents’ perceptions of what constituted a “healthy food” changed as a result of commercial marketing campaigns. For example, canned fruits, which are packaged in high fructose corn-syrup and chemical preservatives and contain substantially more calories than fresh fruit were seen by adolescents as equally healthy as their fresh fruit counterparts, but slightly more desirable. Further, “dieting”, which they defined as following a structured, calorie restricted eating regime, was seen as a normal way of eating among female adolescents.

Several similar studies in the U.S. have examined the ways in which commercial food marketing campaigns have contributed to childhood overweight and obesity. Schor and Ford (2007), note that in 2005, preadolescent children in the United States were exposed to an average of 8.5 hours of media per day. Commercial food industries have capitalized on this media exposure as a conduit for marketing a variety of high sugar, high carbohydrate processed foods to children, and spend billions of US dollars on marketing campaigns targeted to this demographic. Their findings showed that total marketing expenditures for children’s food ads in the United States rose significantly from $2 billion in 1999 to approximately $15 billion in 2004. The authors estimate that 25% of the total time preadolescents are exposed to media consists of commercial marketing advertisements for high-sugar, high-carbohydrate foods. These ads are designed to imbue these foods with symbolic meaning, making them appear “cool”, great
tasting, prestigious and a healthy, sensible choice for parents to make for their children (Schor and Ford 2007).

These studies, while not directly dealing with food marketing in Monteverde, provide a conjectural backdrop for contextualizing commercial food marketing efforts in the region. Ethnographic observations collected for this study suggest that in Santa Elena — the tourist hub of Monteverde, where food supplies are becoming increasingly delocalized and commodified — ad campaigns such as these are becoming more commonplace. Brightly colored banners and storefront billboards depicting advertisements for sugary soft drinks, beer, candy, and energy drinks line the main road from Monteverde to Santa Elena. Television commercials showing smiling kids eating a frosted breakfast cereal right before a soccer match can be seen on Saturday mornings, and an energy drink was the primary sponsor of a community-wide bike race.

These examples help to elucidate the complex biosocial nature of nutritional health and globalization. They provide a general overview of the confluence of material factors and ideational factors that affect food security status, food preferences, and dietary and lifestyle patterns. Specifically they show how structural changes in the political economy of a region constrain economic access to healthy foods, how peer influences play a direct role in shaping food preferences that contribute to unhealthy eating habits, and how commercial marketing campaigns influence children’s food preferences. Moreover, they show that food insecurity is indeed a holistic phenomenon that affects the nutritional, physical, social and mental health of affected populations.
The Green Mountains

The Monteverde zone (green mountain) of Costa Rica refers to an area of mountainous, densely forested land in the Northwestern region of the province of Puntarenas. The area has been inhabited by Costa Ricans for several decades, but was formally settled by North American Quakers in 1951. The area is populated by three main communities surrounded by 24 outlying towns ranging in size from 100 to over 2000 people (Himmelgreen, et al. 2006). Monteverde is occupied by Ticos and Quakers year-round, but is seeing increasing numbers of researchers, students, and tourists coming to work and visit seasonally (Himmelgreen, et al. 2006). The Monteverde zone is situated along the continental divide in the Tilarán highlands at an altitude of between 1,200 and 1,400 meters above sea level, the zone is located between the Caribbean Sea and Pacific Ocean. The warm, humid Caribbean winds from the East combine with the cooler, drier air from Pacific Ocean to the West to produce a persistent cloud bank that blankets the region in a cool, moisture-laden fog (Vivanco 2006). The altitude and humid air give the zone a cooler climate than in the surrounding lowlands, and its close proximity to the Earth’s equator provides fairly constant temperatures year round. The stable climate, ample moisture in the air, and frequent rainfall have given rise to a vast and diverse ecology that has earned Costa Rica the nickname “The Green Republic” (Evans 1999).
In 1948, four U.S. Quakers from Alabama were jailed for refusing to report for military service during the Korean War draft. This prompted the community of Quakers to explore other nations where they could live a life consonant with their deontological beliefs of pacifism (monteverde.org 2011). In 1948, the Costa Rican government had officially abolished the national army, making Costa Rica an attractive political choice for the Quakers to plant a new community. A scout team was sent from Alabama to explore the area and reported back that the mountainous terrain, rich soil and lush canopy
of the Costa Rican Tilarán Mountains would provide a suitable location for farming and dairy production. In 1949, a group of eleven families from the Quaker community in Alabama made the journey from Alabama through Mexico and South America to Costa Rica to begin a new life (monteverde.org 2011). In 1951, the Quakers officially purchased the land tract from a mining company and formally named it Monteverde (Vivanco 2006).

Figure 2: The meeting in which the Quaker group listened to the reports from the scouting party and made their decision to move to what is now Monteverde. April 1951 (mfsch.org 2011).
Figure 3: Traveling overland from the United States, Hubert Mendenhall’s truck made it to approximately 30 kilometers outside of Monteverde at which point the contents were transferred to oxen and cart for the balance of the journey. May, 1951 (mfsch.org 2011).

The Quaker arrival in the region marked the beginning of a new era for the Monteverde zone. Prior to the Quaker arrival, the area had been inhabited solely by native Costa Ricans since at least 1920’s, if not before (Vivanco 2006). The original *Tico* (native Costa Ricans) inhabitants considered themselves to be part of a neighborhood of Guacimal, an inactive gold-mining town located approximately 15 kms down the mountain from the settlement. The original name for this town was Espirino before the land was divided into the now separate towns of Santa Elena and *Cerro Plano* (flat hill) (Griffith and al. 2000). Vivanco (2006) recounts that other than the land owned by the mining corporation, land ownership among locals was an informal and partial affair with few written or reliable records kept that might indicate the ownership history of land.
parcels, where property boundaries lay, or even a historical record of who lived there. Landowners often resisted registering ownership with the National Registry to avoid paying taxes and transaction fees. This gap in official records led to a history of disputes among property owners over ownership rights and boundary conflicts. In some cases this could even result in violence. One resident of Monteverde recounted a story where force and intimidation were used regularly in a generations-long feud between two families over property boundaries. Even today, as the need for property records increases to keep up with the expanding ecotourism industry, information collected for this study showed that any discussion of the actual boundaries of the zone or its towns can only be approximate. Therefore, discussions on the boundaries of the region and its towns need to be regarded as tentative.

The intermingling of Tico culture with the Quaker settlement played a central role in shaping the cultural history and topography of the Monte Verde region. The Quakers settled and began diary farming and raising their families along side local Ticos in a relationship that would come to define the region. The Quakers founded bilingual schools that are attended by Tico and Quaker children alike, and offer them an opportunity to be educated together, build social bonds, and learn Spanish and English. Quakers and Ticos also worked together to formalize the ecological conservation efforts and establish the Monteverde Cloud Forest Reserve.

The Cloud Forest Reserve, which has become Monteverde’s central draw for the ecotourism industry, was founded in the 1970’s as a result of formalized conservations efforts (monteverde.org 2011). During the 1950’s, Monteverde lacked roads suitable for transferring large amounts of timber between regional markets. The early Tico and
Quaker settlers were a trade isolated community and relied on the densely packed forest for subsistence farming for the raw materials of construction. Areas of forest were cleared to obtain access to the rich soil underneath in which to plant crops and raise livestock, and the resulting timber from felled trees was used within the community for construction purposes; however, whatever could not be used was burned (Griffith and al. 2000). This practice of slash and burn agriculture to expand one’s arable land was fueled largely by pressure to make the land *rendir* (to surrender or give) in order to fulfill obligations to private lenders and later, state-funded programs, that provided farmers with financial incentives to prepare or expand farms. This was based on the expectation that the value of the land lay in its’ potential to yield crops (Vivanco 2006).

During this time, cutting down the forest was seen as a good thing. Slash and burn horticulture was driving by the *rendir* ideology as something that made valuable contributions to the settlements and the economy. However, without regulations or formalized land ownership records, this practice soon began to deplete the natural resources of the area. Members of the Quaker community opposed this practice on ecological grounds. They noted how the watershed of various farmlands was affected by the clearing practices, noting that soil fertility and dairy production had declined by the 1970’s as a result of pasture lands drying up from the deforestation (Monteverdeinfo.com 2012). A concerted effort was made on the part of George Powell, a postdoctoral researcher, and Wilford Guindon, a member of the local Quaker community to alter their farming practices and establish a formal ecological preserve in the area. In 1972, the pair purchased 328 hectares (810 acres) of land from the Guacimal Land Company that had been set aside for mining, as the seed area for what would later become the Monteverde
Cloud Forest Preserve (monteverde.org 2011). Today, the Monteverde Cloud Forest Preserve contains 10,500 hectares (29,946 acres) of land and consists of six ecological zones containing some 2,500 different plant species, 100 species of mammals, 400 bird species, 120 reptilian species and thousands of insect species (Monteverdeinfo.com 2012). It is this extremely high biodiversity that draws the more than 70,000 tourists a year (www.cct.or.cr 2012).

Ecotourism

Ecotourism is a term used loosely to describe tourism that is directed toward exotic, often threatened natural environments. Ecotourism in practice dates back to the 1970’s, (Honey 1994) although it was only recently defined in the 1990’s by the International Ecotourism Society as “responsible travel to natural areas that conserves the environment and improves the well being wellbeing of local people” (TIES 1990).

Scholars studying ecotourism suggest that this definition is satisfied when three objectives are met (a) minimize environmental impact by leaving a small ecological footprint, (b) contribute to conservation either through direct efforts (participating in reforestation efforts, etc.) or through financial contributions, and (c) promote local livelihoods by contributing to a combination of political empowerment and supporting local industry (Almeyda-Zambrano, et al. 2010; Balmy 1997; Honey 1994)

Over the past 30 years, ecotourism has become extremely popular throughout Latin America and other parts of the world. Increasingly, these nations are turning to tourism as a means of generating foreign capital and bolstering economic development (Almeyda-Zambrano, et al. 2010; Honey 1994; Leatherman and Goodman 2005).

Ecotourism’s focus on observing threatened natural environments goes hand in hand with
conservation efforts, and the novelty of threatened and exotic environments that drives the economic engine of this industry provides a financial incentive for businesses to preserve these locals (Almeyda-Zambrano, et al. 2010).

In Costa Rica, tourism has increased 60-fold from an estimated $10 million (USD) in 1964 to $661 million in 1995 (adjusting for inflation) (Weaver 1999), and from 2000 – 2003, ecotourism alone accounted for an 11% increase in all international arrivals to Costa Rica (WTO 2010). Table 1 shows that in 2008 over two million tourists visited Costa Rica from Europe and North, Central, and South America. Of those, nearly half were from North America (inclusive of the United States and Canada) (ICT 2009).

Table 1

<table>
<thead>
<tr>
<th>Region of Origin</th>
<th>Visitors (in 1000s)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>976,561</td>
<td>46.7</td>
</tr>
<tr>
<td>Central America</td>
<td>648,586</td>
<td>31.0</td>
</tr>
<tr>
<td>Europe</td>
<td>289,379</td>
<td>13.9</td>
</tr>
<tr>
<td>South America</td>
<td>114,111</td>
<td>5.5</td>
</tr>
</tbody>
</table>

This influx of foreign capital and environmentally friendly businesses has had an overall positive effect on the economy in Costa Rica. In a study evaluating the social and environmental impacts of ecotourism on the Nicoya Peninsula, a popular tourist destination very close to the Monteverde zone, Almeyda-Zambrano and colleagues (2010) found that the ecotourism industry stimulated awareness and concern for the surrounding ecology, promoted use of green technologies, and bolstered the income of locals. However, there is also a negative side to ecotourism that often goes unreported in the mainstream media. As Himmelgreen and colleagues (2006) have shown, in Monteverde, this increased income is tied to the tourism industry and varies throughout the year with the rise and fall of the tourist season. This ebb and flow of income,
combined with inflated food prices driven by the tourism industry, have increased the level of food insecurity in the region (Himmelgreen, et al. 2006).

The Ecotourism Boom

In the early days following the formal settlement of Monteverde in the 1950s, the economy was primarily agriculturally based. Commercial dairy farming and coffee production were the largest economic contributors in the area, but small family farms also played an important part in the local economy. Many residents in the area engaged in subsistence farming or gardening to supplement their diet. Food cooperatives were organized that allowed farmers to share in the profits, harvest and financial and labor investments with larger farms in the area, and allowed members to take advantage of the various agricultural cycles, thus providing a means of dietary diversity and food security for its members (Himmelgreen, et al. 2006). Alvaredo and colleagues (1998) reported that 80% of the farm households in the region relied upon off-farm income generating activities (cooperatives and intermediaries such as canning and food processing facilities) for 50% of their income. In the late 1980s and early 1990s however, Monteverde became a popular tourist destination. The rich biodiversity, lush canopy, and sweeping vistas drew increasing numbers of ecotourists each year. This sudden influx of capital triggered an economic shift away the agriculturally based economy to one reliant upon foreign capital (Himmelgreen, et al. 2006; Honey 1999; Vivanco 2006). Today, Monteverde is listed as the second most popular tourist destination in Costa Rica (ICT 2009).
Study Location

This study was conducted in a small cluster of three towns in the Monteverde zone: Monteverde, San Luis, and Santa Elena. Santa Elena is the most urbanized of the three, and serves as the economic, political and business hub of the region. It is comprised mainly of hotels, restaurants, hostels, shops and commercial tourism businesses, and private residences. The town of Monteverde is located approximately 3.5 kilometers northeast of Santa Elena and is surrounded by farmland and the largest protected biological reserve in the New World (WTO 2010). The town of San Luis is a rural community with an agriculturally based economy located in the valley approximately seven kilometers to the Southeast of Monteverde.

The nutrition and health of Costa Ricans in the early 1950’s was poor, especially among rural populations. By the 1960’s, the failing health of the populous prompted the Costa Rican government to take large-scale action to improve public health. In a move that would come to crystallize the identity of the Costa Rican healthcare system, the Costa Rican congress passed a constitutional amendment that made health care a central human right and operationalized social security provisions that insured federally funded, equal access to healthcare for all persons within the Costa Rican borders, regardless of nationality or residential status (Oduber 1987). A massive concerted effort followed that included nationwide improvements to water utilities and health care institutions. Distribution of safe water to all areas of the country was insured through infrastructure improvements, clinics and hospitals were strategically distributed throughout the country to increase the physical access to health care, and the government implemented health
education and disease prevention programs (Clark 2004). These changes resulted in lower infant mortality rates, reduced incidence of communicable diseases (Oduber 1987), and a life expectancy greater than that in the United States (WHO 2010).

However, these improvements, while effective, have not completely resolved all of Costa Rica’s public healthcare problems. Participant observation and ethnographic interviews collected for this study show that there are many inconsistencies in the health care system. Participants reported having to travel long distances from their homes in the rural mountains of Monteverde to one of the hospitals in Puntarenas or San Jose for diagnostic procedures. Many of the participants in this study lacked personal transportation, and the long travels times to each of these hospitals adds to the difficulty of the experience. A Puntarenas hospital, they are absorbed into an amalgamated mass of hopeful patients waiting to be registered, visiting relatives waiting for permission to enter, and street performers and beggars gathered outside of the hospital doors to peddle from the masses. Once inside the hospital, they report being met with more hours of waiting before being seen by a doctor. Participants report that the long travel days and long wait times only add to the stress and financial impact of their existing affliction.

Despite reductions in infectious diseases and improved life expectancy, in recent years Costa Rica has seen an increase in diet-related, noncommunicable diseases (PAHO 2011). In the last 10 years, increases of Cardiovascular Disease (CVD) and associated risk factors among rural, suburban and urban populations, have been reported, along with increased incidence of coronary heart disease among adolescents (Monge-Rojas, et al. 2002; Nunez-Rivas, et al. 2003). Specifically, in a sample of 1,718 children ages 7 to 12 years pulled from over 34 schools, Núnez-Rivas and colleagues (2003) found that a high
percentage of the sample population were overweight (nearly 35%) and obese (over 25%) in and around the capital city of San Jose. Similarly, incidence of abdominal obesity, a major risk factor in acute non-fatal myocardial infarctions, has also increased in the last decade (Kabagambe, et al. 2007). These increases all correspond with the growing tourism industry and the associated shift in economics away from an agricultural base, and suggest that Costa Rica has experienced an epidemiological shift away from infectious disease to diet-related, non-communicable diseases (Himmelgreen et al 2006).

In a study to measure food security status in the face of this changing economy in Monteverde, Himmelgreen and colleagues (2006) used the Radimer/Cornell food insecurity and hunger scale to assess the degree of food insecurity and hunger in 200 households in the Monteverde zone. Ethnographic data collected in conjunction with the food insecurity data identified several social and economic factors specific to that community that predicted food insecurity in the towns of Santa Elena, an urban town with economy based on tourism Cerro Plano, a town just outside of Santa Elena with a mixed agro-tourism economy, and San Rafael, a rural town with an agriculturally based economy. The ethnographic data collected for that study revealed several culturally specific socioeconomic status indicators. These were used as independent variables in a logistic regression model with the Radimer/Cornell food insecurity categories as the outcome variables. The results show that in Santa Elena, the caretaker’s (main caregiver for children in the household) body weight, the number of rooms in the house, and not having a bank account were significant predictors of food insecurity. In San Rafael, the predictors included the caretaker’s body mass index (BMI), not being a member of a food co-op and not having a working stove were found to predict FI. Their results showed a FI
rate of 67% in San Rafael and 73% in Santa Elena despite statistically significant differences in socioeconomic status between the two town (Himmelgreen, et al. 2006: 303-305).

This chapter has provided a general overview on the study location, the sociohistorical and political economic history of the Monteverde zone and the previous research conducted in the area upon which this work is based. Chapter two will provide a more in-depth look at the concepts and definitions of food insecurity and stress used in this study, and how they interrelate to affect the physical and mental health of individuals. Further, this chapter will conclude with an anthropological critique of the most popular stress model used in research, which will lead into chapter four, a theoretical discussion on how viewing food insecurity as a phenomenologically embodied phenomenon can be useful for elucidating its effects on mental wellbeing.
Chapter 3: Food Insecurity and Stress

Both food insecurity and stress have undergone several conceptual changes in the past half century. A critical examination of these changes shows a paradigmatic evolution from a biological reductionist standpoint to one more inclusive of perceptual factors. This recognition of human perception as a component of psychosocial stress and food insecurity has lead to a more robust understanding of these two phenomena, and has helped to create targeted interventions. However, food security status and mental wellbeing are in decline worldwide (FAO 2009; Funk and al 2010), and more research on the interaction of food insecurity and mental wellbeing is needed to better inform interventions.

This chapter has three objectives. The first objective is to provide a brief overview of the conceptual history of these two constructs, with special attention given to the shift away from biological reductionism to the inclusion of perceptual factors. The second objective is to discuss the biology of the stress response system, how it is activated via perceptions, and to propose a hypothetical model explaining how food related stress triggers the body’s stress response system. The final objective is to propose how phenomenology and embodiment can be useful in developing a culturally robust understanding of food insecure related stress.
Defining Food Insecurity

Food security (FS) as a concept has evolved through a series of definitions and paradigms over the past half century. The concept was first introduced in 1943 at the historic Hot Springs Conference for the Food and Agriculture Organization of the United Nations. There, FS was defined as having “safe, adequate and suitable supply of food for everyone” (Lyon and Evang 1943). This definition of FS had the underlying assertion of national food sovereignty — that nations should be able to produce enough food to meet the energy and nutritional requirements of their populations domestically, or should be able to purchase supplemental food stuffs if necessary (Pinstrup-Andersen 2009). This definition focused on the supply side dynamics of food stuffs and implied that food availability was the primary limiting factor in developing-nations achieving food security (Coates, et al. 2006).

For nearly 40 years this definition shaped and guided global hunger relief efforts toward redistributing agricultural surpluses from wealthier nations to nations with less stable food sources. However, while these efforts were targeted at bolstering the availability of food stuffs in recipient nations, little attention was given to how these foods were distributed once delivered; while food availability had increased, access had not (Coates, et al. 2006). Additionally, many of these surpluses consisted mainly of corn, wheat, and grains that lead to a homogenized diet lacking in micro and macronutrients (Weingartner 2008). As global weather patterns affected crop yields, surplus redistribution from donating nations became irregular and unpredictable, and it soon
became apparent that more sustainable solutions would need to be developed (Weingartner 2008).

During the 1970’s and 1980’s, the concept of FS was expanded to a more robust concept that gave attention to the distribution of locally produced food and foreign food aid, specifically issues related to food access and availability. This updated definition also included attention to food preferences and the nutritional requirements needed for a population to lead a healthy and productive life (Pinstrup-Andersen 2009). These aspects were included in the amplified definition of FS at the World Food Summit in 1996, when the FAO formally described FS as “a condition in which all people, at all times, have physical and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life” (FAO 1996:23). In 2001, this definition was refined to include the emphasis on social access to food as well. This was done primarily in response to the work of Amartya Sen (1981) that brought to light food entitlements within households that affect the distribution of food among members of the same household; thus the current definition of FS is “a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO 1996:28). Food insecurity, then, exists when any of the above criteria are not met (FAO 1996).

Food Insecurity (FI) is conceptually related to malnutrition (Weingartner 2008), and it is through malnutrition that food insecurity most directly affects physical health. According to the conceptual framework developed by UNICEF (Maxwell and Frankenberger 1992), malnutrition occurs as a result of a number of concurrent factors.
The most immediate effects of malnutrition manifest themselves at the level of individuals when their health status is affected as a result of their dietary intake. Diets low in macronutrients (complex carbohydrates, proteins, healthy fats) and micronutrients (vitamins, minerals) (Shils, et al. 2006) place individuals at risk of a range of infectious and chronic diseases (Adams, et al. 2003; Chandra 1997; Popkin 2006; Shils, et al. 2006; Stuff, et al. 2004). These immediate effects of nutritional status are influenced by three underlying causes that manifest themselves at the household level. They are: (1) the access and availability of sufficient amounts of nutritious and desirable foods to meet the nutritional needs for all the members of the household (food security); (2) adequate time, attention and support for a caretaker to meet the nutritional, mental and social needs of growing children and other household members (relevant for childhood nutritional status); and (3) a proper health environment (safe water, sanitation, environmental safety and shelter and access to health care services (Haddad 1999:12).

The above model has been primarily used in the context of rural areas in developing countries where FI often results in undernutrition. However, it is becoming more applicable in both rural and urban settings as FI is being increasingly linked to overnutrition (Weingartner 2008). Overnutrition refers to a measurable form of malnutrition where an individual has consumed too many calories over a long period of time resulting in overweight or obesity (Shils, et al. 2006). Overnutrition is considered a form of malnutrition because it is indicative of a diet that is both calorically excessive and nutritionally deficient. The concurrence of overweight and obesity with FI has resulted in what many have called the “paradox” of food insecurity (Casey, et al. 2006; Crawford and Webb 2011; Dumke 2005; Tanuminahard, et al. 2007).
The paradoxical link between diet-related, noncommunicable diseases (DRNCD) and FI has been studied for over a decade. Dietz (1995) first noted that both hunger and obesity occur in higher frequencies among lower-income populations in the United States. He noted that the confluence of obesity (an indicator of an energy imbalance), and hunger (an indicator of inadequate food supply), constituted a paradox in the current public health understandings of nutritional pathways: How could someone not be getting enough food and too much at the same time? Subsequent research revealed the resolution to this paradox lies in understanding that someone could be receiving too many calories and not enough nutrients at the same time, and that contextualizing the nutritional environment, dietary behavior, and physical activity patterns in the affected populations within the larger political economic landscape could reveal the underlying sociocultural factors at work. Research into this area has shown that obesogenic foods — foods that are high in calories and low in micro and macro nutrients (Crawford and Webb 2011; Weaver and Hadley 2009) are less expensive than nutrient rich foods, and that cost is a significant factor influencing food choices (Drewnowski and Specter 2004). Caprio and colleagues (Caprio, et al. 2008) have shown that food prices in low-income neighborhoods, in conjunction with hectic life schedules that leave less time for meal preparation and consumption also influence eating patterns (Caprio, et al. 2008). Numerous studies now report an association between FI and chronic overweight and obesity, especially in marginalized communities and communities undergoing rapid economic change. Social and economic factors restrict economic and physical access to healthy foods, and increased work demands limit the amount of time available for meal preparation. These factors create a situation where the most affordable and accessible foods are the so called
obesogenic foods, that are high-calorie, high fat foods that are low in nutritional value (CDC 2010; Crawford and Webb 2011; Drewnowski and Specter 2004; Kaiser, et al. 2004). Compounding this effect, the spread of time and labor saving technologies that accompanies the globalization process reduces the amount of daily physical activity and leads to a more sedentary lifestyle (Fox 1999; Himmelgreen, et al. 2006).

FI has been correlated with strained economic conditions (Bronte-Tinkew, et al. 2007) and increased incidences of depression, anxiety and stress (Hadley and Patil 2008). Other studies show that an inability for a parent to provide the types of food their family desires or enough food to feed their families on a consistent basis has been shown to cause depression, stress and anxiety in the parents (Becquey, et al. 2010; Bronte-Tinkew, et al. 2007; Coates, et al. 2006; Hadley and Patil 2008). Still others show a trickle down effect of food insecurity that affects the children in the household. These studies show that while children may be nutritionally buffered from the effects of reduced food availability by their parents, the children still experience a secondary psychological impact as the stress, depression and anxiety experienced by their parents affects their relationship (Whitaker, et al. 2006)

*The effects of food insecurity and obesity on neurological and mental health*

FI also has a negative effect on the brain and mental health. Recent studies into the effects of obesity on the brain have revealed that obesity has a neurobiological impact on the brain systems that regulate weight stability. Thaller and colleagues (2011) have shown that obesity stemming from a high-fat diet causes neuronal damage to sections of the hypothalamus that regulate energy homeostasis, specifically those responsible for
weight control. Their findings, based on animal models, were substantiated by MRI evidence in humans, and show that over time, this damage results in chronic inflammation of the affected brain areas, neuronal loss, and gliosis (neural scaring), which are commonly associated with Alzheimer’s and Parkinson’s disease.

Depression and anxiety, worry, and psychosocial stress have also been correlated with FI and strained economic relations (Bronte-Tinkew, et al. 2007). Recent research shows that adults in food insecure households are significantly more likely to experience symptoms of depression (Bronte-Tinkew, et al. 2007) and anxiety (Whitaker, et al. 2006) than adults in food secure households. For example, in a longitudinal birth-cohort study looking at mother-child relations in food insecure homes, Bronte-Tinkew et al. (2007) showed that children (ages nine months until beginning kindergarten) were often sheltered from the nutritional impacts of FI by their parents, but still experienced indirect psychological impacts. Mothers in these homes exhibited more symptoms of depression than mothers in food secure homes, which affected infant feeding practices and parent-child bonding time. Likewise, Zaslow and colleagues (1998) have shown that mothers under the stress of a strained household budget and lacking adequate resources to provide desired food portions for their children, experienced prolong periods of sadness, depression, preoccupation, and irritability that impaired their relationship with their children. Children in these households (ages 30-60 months) exhibited symptoms of anxiety and depression and had issues with peer relationships and behavioral problems that persisted after the maternal stress subsided.

These above examples highlight the biosocial nature of food and food security, and underscore that mental wellbeing and physical health are affected by food and food
insecurity by two distinct, yet overlapping pathways. The first pathway is what might be considered a biological, or nutritional pathway, where the nutritional quality and the caloric quantity being consumed can result in poor physical and mental health outcomes. The second pathway is a social pathway through which anxiety experienced from food insecurity affects mental wellbeing. This biosocial interaction lies at the heart of the body’s stress response systems, which are covered in the next section of this chapter.

Food Insecurity, the Stress Response and health outcomes.

There are three reasons why an individual may experience stress in the form of anxiety or depression from being food insecure: First, micronutrient deficiency has been linked to anxiety and depression (Kaplan 2000); second the uncertainty of the household ecology created by food insecurity may introduce stress in the form of anxiety and unpredictability into the lives of individuals within the household; third food insecurity highlights the relative differences between households in the community, magnifying the potential stress associated with the socioeconomic differences (Weaver and Hadley 2009).

The neurochemistry of the stress response has been studied extensively. While there still remains much to be discovered about the interactions between the stress response systems, the brain, and other biological systems, the primary stress response systems are believed to be well understood. The perception of an external stressor triggers the release of corticotrophin-releasing hormone (CRH) and arginine-vasopressin (AVP) by the hypothalamus into the hypophyseal portal system. This triggers the locus ceruleus and noradrenergic cell group (LC/NE system) that activate the autonomic and
neuroendocrine responses that serve as the body’s biological alarm system. This in turn engages the sympathetic nervous system and provides the fight-or-flight response to prepare the body to fight or flee the perceived threat (Tsigos and Chrousos 1994). This system evolved as a means to cull the body’s energy resources for a rapid short-term deployment, but it is a costly expenditure in terms of energy: prolonged or too frequent activation of these systems causes wear and tear on the constituent parts that can lead to a number of deleterious health problems.

In the late 1990’s the concept of allostasis and allostatic load was developed to explain the interaction of the hypothalamus-pituitary-adrenal axis (HPA), and the negative health effects associated with chronic and repeated activation of the stress response of a long period of time. Research has shown that chronic activation of these systems leads to wear and tear on the components of these systems, that has been linked to a number of deleterious health outcomes including, hypertension, obesity, type 2 diabetes, and coronary hearth disease, and metabolic syndrome (Massey 2004).

The hypothalamus-pituitary-adrenal (HPA) axis is an interaction of the pituitary and adrenal glands, and is mediated by the hypothalamus. When an individual perceives a threat, the hypothalamus signals the adrenal glands to release adrenalin into the bloodstream, which signals the body to prepare for evasive or defensive action. Adrenalin raises blood pressure by accelerating the heartbeat and constricting blood vessels in the skin to redirect blood flow to the internal organs and the large muscles of the arms and legs. Adrenalin also signals the release of white blood cells and the clotting agent *fibrogen*, into the blood stream to prepare to fight infection and promote clotting in the case of injury. Adrenalin also dilates the bronchial tubes, increases respiration to
accelerate the oxygenation of the blood, and releases fatty acids and glucose into the blood as a ready source of energy (Massey 2004).

The hypothalamus simultaneously signals the pituitary gland to release *adrenocorticotropic hormone*, which in turn tells the adrenal glands to secrete *cortisol* into the blood. Cortisol converts excess glucose in the blood stream into glycogen and fat, replacing energy stores depleted by the adrenalin, and promotes the conversion of muscle protein into fat. Cortisol also blocks insulin from taking up glucose, extracts minerals from bone tissue, and changes the texture of white blood cells to make them more adhesive to promote clotting (Massey 2004). The wear and tear on the body’s systems from the prolonged to frequent activation of this response leads to *allostatic load*, which has been linked to many deleterious health outcomes such as metabolic syndrome (Massey 2004), and impaired memory and cognition (McEwen and Milner 2007; McEwen and Sapolsky 1995; Stewart 2006).

**Stress**

Stress has long been the subject of interest for researchers interested in how environmental and social factors influence human health (Ice 2007). However, definitions and conceptualizations of “stress” are widely varied and are not consistent across disciplines. In fact, Cohen and colleagues (1995) have noted that the term “stress” has become such a general term in the literature that it has arguably lost its value as an analytical concept altogether. In a critical review of the literature surrounding stress, Koolhass and colleagues (2011) also noted that the concept of stress includes a
spectrum of stimuli, ranging from mildly challenging stimulations to severely aversive conditions on one end, to rewarding stimuli on the other.

Stress, as it relates to health research, is often defined in terms of a threat, real or implied, to homeostasis (McEwen 2000). Homeostasis refers to the body’s ability to maintain a number of biological systems like, pH, temperature, oxygen tension and hormonal balance that are necessary for survival (McEwen 2000:175). Stressors, then, are stimuli that offset the body’s homeostasis, and place a demand on the body’s systems as they try to restore homeostasis (McEwen 1998). Prolonged exposure to stressors can lead to a chronic activation of the body’s stress responses. Overtime, this places a strain on those systems, a condition known as allostatic load, that has been linked to many of the same chronic diseases as overnutrition FI (Massey 2004; McEwen 1998). As FI in the Monteverde region is a result of underlying rapid changes in the economic and nutritional environment (Himmelgreen et al. 2006), stress in this work will refer to: “a process in which environmental demands tax or exceed the adaptive capacity of an organism, resulting in psychological and biological changes that may place persons at risk for disease” (Cohen, et al. 1995: 3, italics in original). However, in this context, I wish extend Cohen and colleagues’ definition of the “environment” – which they use to refer to the ecological environment – to include the nutritional and social environments as well. This approach facilitates the methodological orientation of embodiment that places the individual within a constitution of cultural objects (Csordas 2002), and enables us to critically examine the role of ecological, nutritional, and social factors that illicit a stress response.

The primary organ involved in interpreting and responding to stressors is the brain (McEwen 2007). While numerous studies on the stress response across different cultures
show that there is common biological response to stress shared among the human species (Cohen, et al. 1983; Glaser and Kiecolt-Glaser 1994; Woolley, et al. 1990), perceptions of stimuli, coping mechanisms and behavioral responses vary from culture to culture, as do symptom clusters for mental health (Ice and James 2007b). Therefore, investigations into local conceptions of stress and local stressors are appropriate when examining the impact of local stressors on mental wellbeing.

The stress response involves psychological and biological responses as well as a host of cultural and behavioral responses. The psychological and biological response evolved for short-term use. These responses cull the body’s resources to focus the mind and increase the amount energy available for immediate action - the so called *fight or flight response* (Sterling 2004). This is an adaptive response that evolved to prepare the body to fight or flee from a perceived threat (McEwen 2000). However, prolonged or repeated activation of this response has been linked to numerous deleterious health conditions such as impaired cognition (McEwen 1999; McEwen and Sapolsky 1995; Woolley, et al. 1990), depression, anxiety (Brown, et al. 1997; Clark and Watson 1991; Pittenger and Duman 2007), overweight and obesity, hypertension, as well as chronic diseases such as cardiovascular disease and type II diabetes (Sterling 2004; Stewart 2006).

Cultural and behavioral responses can be classified as *mediators* and *moderators* and influence the psychological and biological responses. Generally, mediators refer to factors through which a stressor is experienced and moderators are factors that change the relationship of stressors to lessen the negative impact (Ice 2007). Despite a correlation among stress, mental health, and disease outcomes in FI communities, there remains a large portion of individuals who do not become ill and do not experience as many
symptoms of anxiety, depression, and worry when confronted with similar stressors (Cohen, et al. 1995; Kessler, et al. 1985). This raises the question as to the role that perception plays in appraising an event as stressful or non-stressful.

Perception plays a key role in appraisal process. The same event can be perceived as either benign or threatening to two different individuals based on their past experiences. For example, the loud pop of a car engine backfiring may simply startle one person, but trigger an acute panic response in a combat veteran suffering from combat-induced Post Traumatic Stress Syndrome (MHA 2011). Conversely, clinical counseling and transcendental meditation have been shown to help ameliorate the stress response to triggers an individual once perceived as threatening (Rainforth 2007).

Clearly understanding how perceptions are formed play a vital role in developing interventions, yet how to measure perception is still contested in the literature (2005). The most widely accepted view focuses on vulnerability factors, factors that make people differentially susceptible to environmental and social stressors. These include long and unfulfilling work hours (Sterling 2004), dangerous working conditions (Goodman and Leatherman 1998), poverty and racial discrimination (Massey 2004) and violence, trauma and political unrest (Kessler, et al. 1985). This view takes into account both the high degree of agreement in symptomatic manifestations of cumulative stress (body pains, headaches, gastrointestinal problems, fatigue, depression, anxiety, moodiness, and high blood pressure) in varying populations, and the differential vulnerability of populations as an assessment of stress and stress associated disease. However, as it only focuses on stress outcomes, phenomenological perspectives that would give insight into how perceptions of events are shaped are missing.
Typically mediators and moderators are classified as into four basic categories: social, behavioral, personality and historical context (Ice and James 2007a). The social category contains the social networks, friends, family and work relationships in which the individual is embedded. The behavioral category contains the behaviors an individual might adopt to cope with stress, and the personality category focuses on personality typologies (type A/B, optimism/pessimism, etc.) that might affect the appraisal process and coping behaviors. Historical context contains information about personal and local historical context that might attenuate or amplify the stress response (Ice and James 2007a). However, as personality typologies are largely a Western construct (Ice and James 2007a), personality inventories may not be compatible cross culturally. Therefore as this study focuses on perceptions of stress, I propose that this category be substituted with the category of “phenomenology.” This category will include the qualitative information on the local and personal historical context of an event, but be expanded to include shared cultural beliefs that work in concert to shape perceptions of events. This information will help the researcher understand how events are perceived and embodied to trigger the biological and psychological responses, and how they motivate coping behavior.

The concept of stress, as it pertains to health outcomes, has evolved considerably through a series of paradigms in the past several decades of theory and practice. At the heart of each of these paradigms lies the notion of homeostasis – the process by which biological organisms maintain normal physiological and biochemical function (Stewart 2006). The goal of each of these paradigms was to explain, with reference to the parameters subsumed within each orientation, those factors, influences and stimuli that
upset the body’s internal equilibrium and triggered the stress response. As perception is a key component to triggering the stress response, understanding how perceptions are shaped is central to understanding the link between the mind and health outcomes. Further, as perceptions are cultural products, anthropology is ideally situated to capture and articulate salient, culturally based phenomenon that become embodied as biological and mental health outcomes.

Defining Stress

Stress is a broad concept that has a multitude of definitions across different disciplines. Definitions vary with regard to which aspects of stress each discipline is looking at. Because of this, interdisciplinary perspectives on stress can often be confusing as these definitions are not always equivalent (Ice and James 2007a). The term “stress” has been used in its history to refer to at least different component of the stress process: 1) the input, stimuli or event that elicits the reaction; 2) physiological and psychological processing systems, and 3) the output or stress response (e.g. biological, behavioral, psychological) (Ice and James 2007a).

Cannon (1914) was the first to examine the effects of psychologically meaningful events on mood (Cannon 1929) and outlined the fight or flight response. Also coined the term “homeostasis” to refer to the process of maintaining internal stability amidst environmental change (Cannon 1932). He also discovered the specialized sensory nerves the communicated states of rest and unrest to the brain, and noted that failure to maintain homeostasis could result in tissue damage (Cannon 1932).
Hans Selye (1936) popularized the term “stress” in his seminal 1936 paper which many researchers credit as the origin of the term (Ice and James 2007b). He described stress as a “non-specific response of the body’s “noxious stimuli” to psychologically meaningful events. He further elaborated on this concept, calling in the general adaptation syndrome. He outlined this syndrome as having three stages: 1) alarm and reaction; 2) stage of resistance and 3) stage of exhaustion. Selye defined exhaustion as the process of the body depleting its glucocorticoids (Selye 1946) (a group of corticosteroids involved in the metabolic process and anti-inflammatory activity (Dallman, et al. 2003).

Adolf Meyer and Harold Wolf are credited with the first research examining the effects of stressful life events on illness (Cohen and Kessler 1997; Rahe 1989). Meyer suggest that physicians routinize cataloging life histories as part of medical examinations(Cohen and Kessler 1997). One of the first standardized scales of life events was developed by Holmes and Rahe (Holmes and Rahe 1967), and has become the foundation upon which many life events scales today are based (Ice and James 2007b).

Throughout the 1960s and 1970s, stress research continued to focus on major life events. During the early 1980s however, it became apparent that variation existed among stress responses. Lazarus and colleagues theorized that this was due to variations in individuals’ perceptions of events. In several publications (Lazarus 1984; Lazarus 1982) he argued that the Selye and Cannon approaches to stress were too simplistic and proposed a new, stimulus-centered perspective. This perspective took a cognitivist approach to stress to account for the variation in responses. Lazarus and Folkman (1984) proposed that stress was a result of an individual’s interaction with their environment,
and the impact of any individual stimulus was a function of their appraisal of it. Peralin and colleagues further added to the appraisal model of stress by showing that appraisal of events that are out of the individual’s control, unscheduled, non-normative were the most harmful (Pearlin 1989), and that socioeconomic context played a large role in moderating the appraisal process (Pearlin 1989). Pearlin further suggested that stress related health affects were not due to one major event, but rather continuous exposure to smaller stressful events (Ice and James 2007b).

Lazarus has argued against a socio-cultural approach to stress with regards to social context mediating the stress response (Lazarus 1993b). He argues that this approach leads to sweeping generalizations about variations in the stress response in groups of people, which is in contrast to the cognitivist, individually focused approach he outlines. However, Dressler has shown repeatedly that enculturated meaning imbued to events plays a role in moderating physiological and behavioral responses to stress (Dressler 1991; Dressler 1995; Dressler 2000; Dressler and Bindon 1997; Dressler, et al. 2007)

**Perspectives on stress**

Like the concept of food insecurity, concepts of stress have undergone many changes in the past century. Stress was initially approached as a response to a universal and quantifiable set of stimuli in the social and natural environment. Studies were designed to catalog those stimuli to better inform clinical interventions (Ice and James 2007c). This paradigm was at odds with a competing paradigm that focused on stress as a result of a subjective interpretation of social and natural stimuli, which saw social factors such as age, socioeconomic status, gender, and race as modifiers for appraising
stimuli as either stressful or benign. Each of these schools of thought presupposed a universal model of brain function, and neither recognized neurological or psychological variation as a mediating variable of the stress response. Gradually, these two camps gave way to a unified view that incorporates psychological and biological factors with social and cultural factors. The following section presents a brief history of the evolution of the conceptualization of stress.

The Environmental Stress Perspective

The environmental stress perspective focuses on influences from both the social and natural environments on human health. This perspective was first advocated in the 1930s by Adolf Meyer, a physician who noted how changes in life events of his patients were etiological to their physical health (Cohen, et al. 1995). Meyer’s ideas became a popular research topic, and by the 1940s, substantial evidence existed showing associations between a variety of stressful life events and a number of illnesses. By the 1970’s, concerns over existing stress inventories’ ability to accurately represent the variation in the population led to studies into specific life events experienced by different subdivisions of the population. New checklists were designed based on socioeconomic status, age, gender, and race to measure stress in these populations whose life events might differ those of the general population. This led to two competing conceptualizations on stress assessment: the formalist view that focused on the subjective experience of the individual and how specific events worked to produced a stress response; and the substantivist view that focused on how classes of life events produced somatic and emotional responses in individuals (Cohen, et al. 1995).
Today, much of this tension between these two camps has been resolved by acknowledging both the high degree of agreement in symptomatic manifestations of cumulative stress in varying populations, and the differential vulnerability of populations to stress and stress-associated disease. These vulnerability factors focus on categories of factors that may increase a person’s or population’s resiliency to stressful life events and disease. In addition, more research has been done that focuses on the cumulative effects of minor daily stressors on the emotional and physical health of the individual (Cohen, et al. 1995; Massey 2004).

In the Monteverde zone specifically, rapid economic change and the seasonal nature of the tourism industry creates a situation whereby food prices are driven up by the influx of tourism, and remain high long after the tourist season is over. Local Ticos (Costa Rican nationals) are left with an imbalance between inflated food prices and reduced income, limiting their ability to purchase desirable foods (Himmelgreen, et al. 2006). In addition, the increased consumption of processed foods high in calories and low in nutritional value could be seen as a vulnerability factor that increases the local population’s cumulative stress and susceptibility to chronic diet and stress-related diseases.

The Psychological Perspective

The Psychological perspective focuses on the individual’s subjective perception and evaluation of an event. Psychological models argue that events are judged to be stressful by an individual in relationship to their environments — that is the stress of an event one is experiencing is the product of both the symbolic meaning of the event in the social space, and the evaluation of coping strategies available (Cohen, et al. 1995).
The most popular model of the appraisal process was posited by Lazarus (Lazarus 1966). In this model, Lazarus argued that the appraisal process for an event to be deemed threatening could be broken down into two parts. The initial part, the **primary appraisal** occurs between the time when the individual is first exposed to the event and the stress response, and is dependent upon the situation in which the event occurs and the psychological structure of the individual. The **secondary appraisal** occurs when an individual evaluates their resources to decide how best to **cope** with the event. In this definition, **coping** refers to the action the individual takes to eliminate or reduce the effects of the event (Cohen, et al. 1995).

The psychological model recognizes that certain events may be almost universally stressful; however, it emphasizes that the stress response to these events will vary with the individual. Within this model, variation in responses to given stimuli, such as the death of a loved one, would be due to the mediation of the stress response by the appraisal process. Absent from this model are culturally based mediators. The incorporation of symbolic aspects surrounding the appraisal of stressful events could prove useful in anthropology when developing cultural consensus models for stress in a culture.

**The Biological Perspective**

While not the central focus of this study, the biological perspective is included here to illustrate the psychobiocultural connection between chronic stress and the cumulative effects of chronic stress on disease susceptibility. The biological perspective focuses on the physiology and activation of biological systems involved in the stress response. The most predominantly interrelated systems involved are the that of the
hypothalamus, the pituitary gland and adrenal glands, or the hypothalamus-pituitary adrenal axis (HPA) (McEwen 2000). Much has been written on this system and in depth physiological explanation exceeds the scope of this literature review, therefore this system and its relationship to health will only be described in brief here.

*Unified Theory of Stress*

Although each of these perspectives on stress has contributed much to our understanding of stress and its affect on human beings, historically each of these perspectives has focused on the stress systems exclusively contained within the perspective and ignored the interrelated biological systems, thus limiting progress toward a holistic understanding of how stress affects the mind and body. Cohen and colleagues (1995) have proposed a unified heuristic model for problematizing the effects of stress on an individual (figure 2). Here, environmental stressors are filtered through the appraisal process and stimulate an emotional and physiological response based on the appraisal outcome. The authors have identified one of many possible feedback loops (dashed lines) where physiological or behavior responses may feedback into the appraisal process, either through impaired cognition (allostatic load) or through behavioral changes such as withdrawal, avoidance, and substance abuse (Lazarus 1993b).
Other models have attempted to unify these perspectives as to show how allostatic load leads to a host of negative behavioral and physiological problems that increase the differential disease susceptibility and vulnerability of minority racial and low socioeconomic groups (Massey 2004; McEwen 1998). In Figure 5, Himmelgreen (2011) illustrates how repeated stress has negative consequences for the entire body.
Reactions to events that are deemed threatening feedback into the appraisal process and can increase the load of the biological mechanisms involved in the stress response. Repeated activation of the stress response leads to wear and tear on these systems. Over time this results in reduced cognitive ability, coronary heart disease, myocardial infarction, obesity, diabetes, hypertension, cancer, impaired immune response, PTSD, depression, and anxiety (McEwen 1998).

Chronic activation of the HPA has been shown to increase the ingestion of so called “comfort foods,” which can increase susceptibility to CVD. Dallman and colleagues (2003) have shown that foods high in calories and fat cause the body to secrete steroids involved in the metabolism of glucose called glucocorticoids (GC). GCs inhibit the continued activity of the HPA axis and provide short-term relief from the affects of stress by interrupting the allostatic response. However, prolonged elevated concentrations of GCs prove to be excitatory and stimulating, which reinforces and motivates the consumption of these foods. New evidence also shows that diets high in saturated fats
and cholesterol lead to hippocampal damage and memory loss (Granholm and Bimonte-Nelson 2008). Thus, chronic stress resulting from repeated exposure to adverse environments – such as conditions of job scarcity, food insecurity and poverty – can lead to a diet-related coping strategy that results in weight gain, obesity, type 2 diabetes and cognitive impairment.

Metabolic Syndrome

Metabolic Syndrome is characterized by a group of concurrent risk factors in an individual. They include: abdominal obesity, elevated triglycerides, low HDL cholesterol and high LDL cholesterol, hypertension, insulin resistance, type 2 diabetes, and, high amounts of fibrinogen and cortisol in the bloodstream. Individuals with Metabolic Syndrome have an increased risk for a host of deleterious medical conditions associated with obesity and hypertension, such as heart attack and stroke. Causes of Metabolic syndrome vary, but are primarily linked to diet and stress (AHA 2010).

The literature detailing the various systems involved in the stress response and how they interrelate through various perceptual, psychological, and biochemical pathways, illustrates the holistic and interconnected nature of the human experience. Accordingly, anthropological perspectives on stress should take a holistic approach that reframes stress in terms of biosocial phenomenon. In such a view, phenomena that occur in the social environment are embodied to produce a biological response via meaning imbued through encultured beliefs, past experiences and social context.

The perceptual model of stress has two shortcomings as it applies to food insecurity that I will discuss here. First, the model proposes a binary classification schema whereby
events are appraised as either stressful or benign. This presumes a mutual exclusivity between these categories and thus limits its applicability to acute stressors where isolated events trigger a short-term stress reaction. This is useful for immediate threat appraisal, such as in the case of imminent physical harm where a quick appraisal and rapid action are needed; however, the physical and mental health affects described in this study are the result of prolonged conditions of food insecurity. Therefore, in these situations a model of chronic stress, such as allostasis and allostatic load, may prove useful in elucidating the physical health and mental wellbeing dynamics related to food insecurity.

Second, the perceptual model of stress borrows heavily from Western psychology’s cognitivist view of the self. In this view, the self is a function of the neurophysiological processes of learning. The self resides in the mind, which resides squarely within the brain, and emerges as a function of the brain learning the rules of the world. The brain is seen as a computer, and learning these rules forms synaptic connections in the brain that over time develop into a kind of program that facilities and structures mental processes (Dreyfus 1996). In this view, the mind is objectified from the body — a “symbol-manipulating machine” (Thompson 2007), where symbolic sensory inputs from the natural world are neurologically reified as experiences via synaptic connections in the brain. These connections make up the cognitive fabric of the brain’s neural network, and dictate behavior, perception and identity (Thompson 2007). This view gained popularity as it made ideas of consciousness scientifically acceptable, but it also divorced emotion, affect and motivation from the science of the mind, regarding them as subordinate to cognition: simply a function of the underlying mental programming. In this view as Thompson (2007) put it, “it is the software, not the hardware, that matters most” (pg.5).
This fundamental dichotomy has set up other anthropologically problematic dichotomies; for example: as mind is separate from body, so thought is separate from emotion and self is separate from community (Csordas 2002).

However, this mind-body dualism, and the view of the brain as the locus of the mind is becoming increasingly dissonant with recent research on the interconnected nature of the mind and body. Over the past two decades there has been mounting evidence showing that a dualistic paradigm of the mind/body is insufficient for examining what Dewey (1925) has called “the inclusive integrity of experience” (p.9). New research is showing that mental wellbeing is affected by non-cognitive processes, such as the body’s inflammatory response system. For example, cytokines (protein molecules that are secreted by numerous cells and used in intercellular communication (Gilman, et al. 2001) are part of the body’s immune system and are involved in the inflammatory regulation during the healing process. Elevated levels of two particular cytokines, interleukin (IL)-6 and IL-1 have been linked specifically to depression and sickness behaviors (inactivity and negative mood) (Howren, et al. 2009). Both IL-6 and IL-1 are released by macrophages to facilitate inflammation during injury-related healing, allergic reactions and are involved in fever regulation. However, it has been shown that subcutaneous adipose tissue has also been found to release IL-6 leading to chronically elevated IL-6 levels in overweight and obese individuals, regardless of injury (Mohamed-Ali, et al. 1997). In a related study, elevated IL-6 and high BMI were also associated with increased depressive and stress symptoms in a self-report measures (Yudkin, et al. 2000). In a systematic review of 51 studies looking at the associations between depression, IL-1, IL-6, and the inflammatory biomarker C-reactive protein (CRP), Howren and colleagues
found that BMI was a significant moderator of both IL-6 and depressive symptoms in both clinician-administered and self-report measures of depressive symptoms. Chronic elevated IL-6 levels released in response to non-food related allergic reactions has also been shown to be associated with depressive symptoms (Patten, et al. 2009; Patten and Williams 2007). Still other research has shown a connection between loneliness, elevated IL-6 and impaired immune function (Hackett, et al. 2012). These studies show how emotions and perceptions can be influenced by physiological functions located outside of the brain and provide examples of an empirical connection between the mind and body. Further, these studies shed light on the fact that human experience is a holistic phenomenon influenced by the myriad of interconnected mind/body systems rather than a series of interpretations made by a skull-bound computer running a learned program.

While the perception models of stress presented here (figures 2 & 3 above) are adaptive models in that they allow for a feedback loop in which outcomes of the stress response (physiological and behavioral responses) feedback into the appraisal process, they are primarily concerned with the appraisal process as a cognitive function solely as it applies to immediate demands and adaptive capacities. More attention needs to be given to social moderators and cross-cultural variation in the appraisal criteria. While these models may prove useful for comparative studies, their limitations impair their capacity to produce novel anthropological insights cross-culturally.

To summarize, the conceptual evolutions of food insecurity and stress represent a paradigmatic trajectory that moves from biologically reductionist, to one more accepting of perceptual factors. However, there remains a lingering biological bias in their
respective literature that constrains more robust understandings of the interrelations of food insecurity and mental wellbeing. While food insecurity incorporates perceptual and social factors related to food, much of the literature remains focused on the biological and nutritional impacts of food insecurity. While the health implications of food insecurity are well documented and substantial, its effect on mental wellbeing remains understudied, and could substantially enhance our understanding of how food insecurity affects the mind and body. The cognitive appraisal model for stress is a useful model for examining acute stressors, but is limited in terms of understanding how chronic stress is experienced cross culturally. These limitations stem from two fundamental considerations: (1) a binary classification of events as stressful or benign; (2) a cognitivist view of the self as an objectified entity. The first consideration may be overcome by using a model for chronic stress such as allostatic load, the second by incorporating aspects of phenomenology and embodiment to examine how encultured perceptions shape the embodiment of events and the resulting physiological response.
Chapter 4: Theoretical Orientation

In this chapter I will outline the major theoretical framework used in this study. This work combines political economic theory with aspects of phenomenology and embodiment theory to explore how the experience of food insecurity affects mental wellbeing. In what follows, I present a brief overview the major components of the theory in three sections. The first section will cover Cartesian reductionist view of the mind and body as two separate entities (the mind-body dualism). I will then present a critique of reductionism using Marx’s dialectical reframing of the mind/body and Merleau-Ponty’s phenomenology of experience. The final section will explain how each of these theoretical components articulate to explain how food insecurity affects mental wellbeing.

As stated in chapter one, the research presented here is guided by a biosocial paradigm. The biosocial perspective, or as it is sometimes referred to in anthropology, biocultural (Goodman and Leatherman 1998) perspective, is a view that the human experience is inherently shaped by both biological and cultural factors (Goodman and Leatherman 1998). This work borrows from Goodman and colleagues’ (1998) view that human biology is a socialized biology, where “...social life is the major mode of evolution of our species, that evolution continues on the basis of historically received but malleable biological constraints, that our biological constraints (already socialized) set the stage for further social processes, and that these intern change the significance of the
constraints.” (p.xiii). However, Paul Farmer (Farmer 2011), who has extensive clinical and research experience as both a medical doctor and an anthropologist dealing with the health outcomes of marginalized peoples in Haiti and Tanzania, has suggested using the term *biosocial* when writing for cross-disciplinary audiences as the term *social* is more widely used outside of anthropology. Therefore, I will use the term *biosocial* in this work to refer to the biocultural synthesis outlined by Goodman and colleagues above.

*Cartesian Reductionism and the Mind-Body Duality*

Cartesian Reductionism is the idea that observable phenomena represent a complex whole made up of a host of smaller parts interacting with each to produce the behavior of the system. This view stems from Rene Descartes’ work *Discours de la Méthode* (Descartes 1637) in which he outlines a methodology for understanding complex systems by breaking them down into their constituent parts. It presupposes a mechanistic world where phenomena are the result of the intricate inner workings of individual atomistic parts, each having certain fixed intrinsic properties, like the gears of a clock. Descartes posited that the systematic observation of interactions of the parts of a system would yield insights into the ontological truths of the universe (Levins and Lewontin 1985).

This method has had enormous success in the physical and natural sciences where scientific inquiry has uncovered many substantial facts about the universe. For example, the discovery of the hierarchy of quanta that make up all of the matter in the universe: atoms are made up of the positively charged *nucleus*, consisting of *protons* and *neutrons*, and a orbiting cloud of negatively charged *electrons*. Atoms cluster together into *molecules* that are held together by the shared orbits of their electrons (Greene 1999). By
understanding the constituent parts of matter and the forces that hold these parts together, scientists discovered that incredible amounts of usable energy could be released by harnessing these atomic forces. However, the Cartesian reductionism as a method of scientific inquiry eventually became intertwined with worldviews and gave rise to the idea that the Universe was like the method. This lead to a confusion of reductionism as a method with reductionism as an ontological stance.

Cartesian reductionism remained a pervasive ideology in the Western sciences for much of the time since the Age of Enlightenment (Lewontin 1991). However, there were several key thinkers who were influenced by the Enlightenment that also took a critical stance against reductionism as a method and a philosophy. Karl Marx was one such figure. Marx’s writing was a product of the Age of Enlightenment, and though he retained many of its principals, such as the importance of reason, the centrality of the problem of freedom, the denial of knowledge based on authority, and the separation of the empirical real world from symbolic representations of it, he struggled with its explanations of human social life (Patterson 2009). Marx rejected the notion of a fixed and reductionist model of the human mind and body and instead reframed the relationship as a historized dialectical interplay between biology and social interactions. Marx believed that human biology provided a substrate that endowed all members of the human species with certain potentials that were shaped by the social networks in which they were embedded, and which they themselves produced (Patterson 2009). For Marx, the primary component through which these potentials are shaped is a function of both the human species’ relationship with the environment and the desires of the consciousness. In the gendered language of the day, Marx wrote:
“Man is directly a natural being. As a natural being and as a living natural being he is on the one hand endowed with natural powers, vital powers—he is an active natural being. These forces exist within him as tendencies and abilities—as instincts. On the other hand, as a natural, corporal, sensuous, objective being he is a suffering, conditioned and limited creature, like animals and plants. That is to say that the objects of his instincts exist outside of him, as objects independent of him; yet these objects are objects that he needs—essential objects, indispensable to the manifestation and confirmation of his essential powers. To say that man is a corporal, living, real, sensuous, objective being full of natural vigour is to say that he has real, sensuous objects as the object of his being or of his life.… Hunger is a natural need; it therefore needs a nature outside itself, an object outside itself, in order to satisfy itself, to be stilled. Hunger is an acknowledged need of my body for an object existing outside it.” (Marx 1844/1975a).

In this quote, Marx acknowledges that human beings are what Patterson (2009:42) called “sensuous beings”, meaning that they are aware of, react to, and are intertwined with the social and natural world in which they live. As sensuous beings, they have sense organs—the eyes, ears, nose, mouth, and skin that constitute the biological substrate, and creates the potential to interact with the outside world. When combined with the motor skills of the body, the potential is released and they are free to interact with the external world, which in turn feeds back into the senses (Patterson 2009). For Marx, this constitutes the basis for the human perceptual system and is the primary means through which humans learn about what objects in the external world satisfy the internal needs (Patterson 2009), and provides the basis for human communication (Gibson 1966).

Marx operationalized his idea that humans were a part of the natural world in the idea of Praxis. Praxis, according to Marx, is a fundamental and inherent characteristic of human beings that sets them apart from other intelligent animals in nature. Praxis is a multidimensional process of human beings interrelating with objects in the external world and with each other. Praxis constitutes the means through which social relationships are created and maintained, and is something from which humans derive their social and
individual identity (Patterson 2009). In defining praxis, Marx firmly establishes his position against fixed reductionist structures in favor of a dialectical intertwining of human beings with the social and natural environment.

The first dimension of praxis is the human activity of production. Marx saw the production of material goods as central to social society and defined social relationships in terms of material production and exchange. He writes:

“Let us suppose that we can carry out production as human beings. Each of us would have been two different ways affirmed himself any other person. (1) In my production I would object and fight my individuality, its specific character, and therefore enjoy not only an individual manifestation of my life during activity, but also I’m looking at the object I would have the individual pleasure of knowing my personality be objective, visible to the senses and hence a power beyond all doubt. In you (sic) enjoyment or use of my product I would have a direct enjoyment of being conscious of having satisfied a human need by my work, that is, of having objectified man’s essential nature, and of having thus created an object corresponding to the need of another man’s essential nature. I would have been for you the mediator between you and the species, and therefore would become recognized as felt by you your self as a completion of your own essential nature and as a necessary part of your yourself, and consequently would know myself to be confirmed by both your tho

Here, Marx makes several points illustrating how praxis mediates social relations as a function of both human activity and consciousness. First, Marx clearly illustrates that production and exchange are the primary means through which social relationships are created and maintained. In this scenario, the speaker uses both his consciousness and his corporal capacity to transform the raw materials in nature into an object. This object is both an expression of his character and personality and an object of aesthetic and practical value (what Marx would later term “use value”). The production of this object
brings enjoyment and satisfaction to the speaker, as does seeing the finished product. This enjoyment is compounded, as another person is able to derive enjoyment from the use of the product and share in the aesthetic appreciation of its form. Because the object represents both the character and personality of its creator and satisfies a practical need in an aesthetic and meaningful way, the creator of the object feels as though he is a mediator between the receivers of the object, the natural world, and has their natural identity, their individual identity and social identity confirmed. For Marx, this enjoyment of creating something that expresses the internal personal identity and corresponds to an essential human need in another constitutes the basis for social relationships, and is a central component shaping human social behavior.

Consciousness is the second dimension of praxis, and is for Marx, closely related to the process of objectification; and as objectification is associated with production and exchange, so is consciousness dialectically intertwined with social relationships. Marx sees consciousness as reacting not only to the raw materials available for production in nature, but also a guiding force in the construction of the object, the meaning imbued within it, but also the awareness of the essential needs, sentiments and emotions of other people (Patterson 2009). In Marx’s praxis, consciousness, as the guiding force in the transformation of raw materials into socially meaningful objects for exchange, is the chief element of the human experience, and is continually being shaped by sociohistorical context.

The above selections from Marx illustrate how he saw the natural state of human beings. In these passages Marx paints an idealistic picture of humanity in a world devoid of power differentials derived from the commodification of goods and the
disproportionate distribution of material wealth. In later writings (Marx 1867/1992), Marx outlines how production under a capitalist system interrupts this natural state of social relationships by placing the Proletariat (those that controlled the means of production in a society) in the role of the mediator in social relationships. As Marx saw an intimate link between consciousness, social relationships and the production and exchange of meaningful goods, the commodification of goods effectively divorced the worker from themselves and their fellow human beings.

Marx’ critique of political economy has been a central theory in applied anthropology, but it is limited in its ability to account for human agency. And while his dialectical reframing of the relationship among the human body, human consciousness and social relations is supported by empirical evidence in modern scientific literature (see chapter 3), his model lacks an explanation for the proximate biosocial pathways through which social phenomena affect physical and mental health. Embodiment and phenomenology provide a means to close this gap in Marxian political economy.

Phenomenology borrows from the French philosopher Maurice Merleau-Ponty’s phenomenology of perception (Merleau-Ponty 1945/2002) in which he states that perception is the epistemological center of all knowledge. He posits that perception is a two-part process that begins with the body. The body is the primary means through which humans experience and interact with the world. Like Marx, Merleau-Ponty sees the body as a sensuous, alive and reactive biological substrate whose sense organs work in concert to mediate consciousness with the external world. However, when compared to Marx, Merleau-Ponty posits a more generalized means through which consciousness is affected. He theorized that consciousness is affected by the embodiment of experiences
via perception rather than limited to the production and exchange of commodities, as Marx thought.

Phenomenology and embodiment can be used to elaborate on political economic examinations by providing a theoretical means for elucidating how power disparities are embodied to affect mental wellbeing. The primary way embodiment does this is by collapsing the mind-body duality and situating the mind/body complex as a culturally constructed entity (Csordas 2002). Embodiment begins from the epistemological stance that our bodies are not objects to us, but are an integral part of our lived experience (Csordas 2002)—a setting upon which our experience of the world unfolds. Embodiment in this model focuses on the physiological responses to experienced stress. Phenomenology then focuses on the perception of events, how perceptions are culturally shaped, and the process by which these perceptions become embodied. The anthropological goal then becomes to investigate how events in the world are phenomenologically perceived and embodied to produce physiological responses. The theory employed here merges political economy with embodiment and phenomenology to get at how the experience of food insecurity (as a result of globalization and a rapidly changing nutritional and economic environment) is embodied to affect mental wellbeing.
Chapter 5: Methods

As mentioned previously, this study was conducted as a supplementary study to an existing longitudinal study (#BNS 0753017) examining the nutritional effects of the rapid economic transition in the Monteverde Zone, and is based on a subsample from the longitudinal study. Data collection for the study occurred in two phases. In the first phase, three focus groups were conducted, each containing between six and eight men and women (interviewed separately), all chosen at random from the longitudinal study population. Focus groups examined common life stressors and local conceptualizations of stress, depression, and anxiety. In the second phase, transcripts from these focus groups were analyzed and used to create a scale that measures experienced stress specific to the population. This scale was first piloted with 10 local Ticos working at the Monteverde Institute, men and women between the ages of 22 and 45 before being administered along with the Household Food Insecurity Access Scale (HFIAS), the Hopkins Symptom Check List (HSCL-24) and the Perceived Stress Scale (PSS) to a subsample (n=54) of the longitudinal study. Each phase of the data collection took place in the Monteverde Zone of Costa Rica. Three part-time research assistants were hired to assist in logistics, data collection, translation, focus group facilitation, and transcription for this project. All of the research assistants were native Spanish speakers, and have lived in worked in Monteverde for more than three years. All three had extensive research experience and were employed as researchers in the longitudinal study.
Recruitment

A power analysis (table 2) conducted using an online statistical calculator (Lenth 2006-9) based on the longitudinal study’s population of 200 households yielded a sub-sample of 50 individuals ($\alpha=.05$). Eligibility for this study was based on inclusion in the longitudinal study. All participants were of at least 18 years of age, and had previously signed informed consent forms to participate in the longitudinal study. Internal Review Board modifications for this study were approved prior to beginning fieldwork (see appendix A).

Table 2: Power analysis using logistic regression statistics

<table>
<thead>
<tr>
<th>N</th>
<th>Number of predictors</th>
<th>n</th>
<th>Power</th>
<th>Detectable contrast</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>3</td>
<td>52</td>
<td>1</td>
<td>.5</td>
</tr>
</tbody>
</table>

Participants were selected using a variety of sampling techniques by the researcher and two trained bilingual assistants. A list of participants from the parent study was divided up by gender and by town (Monteverde, Santa Elena, and San Luis), and an online random number generator (Haahr 2011) was used to make selections of participants from these lists. This was done to ensure that males and females from each town had an equal chance of being selected despite differences in the population demographics.

Participants for the focus groups were selected at random using the method described above and contacted by phone. Those agreeing to take part in the study were provided transportation to the meeting site and compensated $5 (USD) for their time. The second phase of the study used a combination of random and convenience sampling. Participants were initially selected using the method described above and contacted to
schedule interview times. However, it is a common custom in Monteverde for visitors to be offered coffee and refreshments by their hosts. This presents opportunities to gather ethnographic information, but it is not uncommon for these social visits to turn into hours-long conversations. This caused interview times to vary greatly, and in some instances caused a time conflict with another scheduled interview. In cases where a participant was no longer available due to time conflicts, another participant from the list who lived nearby and was available was selected to be interviewed.

The longitudinal study was carried out through a joint effort between the University of South Florida (USF) and the Monteverde Institute (MVI). Two professors from USF’s department of anthropology served as the principal investigator and co-principal investigator of the study, while MVI staff and a USF doctoral student oversaw data collection in the field. Two MVI staff members working in the longitudinal study, who were Costa Rican nationals and native speakers of Spanish, assisted in the logistics and data collection for this project.

The MVI staff working with this project were well known in the area and, as this project utilized a sub sample from the parent study, participants were familiar with this study and its purpose. At each interview, the project staff described the purpose of this study in context with the larger study. It was presented as a supplementary study to the investigacion de nutricion, and participants were told that they would receive $5 as compensation for their participation, and that all information would remain anonymous. Interviews were conducted in participants’ homes or places of employment. The researcher or the research assistant administered all of the instruments orally, except in cases where the presence of participants’ family members or co-workers might have
threatened the security of their responses. In these instances the HFIAS, HSCL-24, the researcher-developed scale, and the PSS were self-administered in the presence of the researcher or research assistant. The project researchers were present at all times to assist participants as needed.

Focus Groups

Focus group interviews were conducted in Spanish by the researcher and one trained bilingual assistant at the Monteverde Institute and at a local church in San Luis. Transportation was provided for all participants using local taxi services and paid for by the NSF grant. Before each focus group, the researcher explained that the session would be audio-recorded and that all information shared by the participants would remain anonymous and confidential. The focus groups were broken up into two sessions. The first session focused on exploring local conceptualizations of stress, depression, and anxiety, and in the second session, a list of common local stressors and people’s experiences with these stressors were solicited. In the first session, a guided interview instrument was used to explore local conceptions of stress, anxiety, and depression.

In each group, participants were instructed to pair up with other study participants in the focus group and to work with their group partner to list as many things as they could that caused them stress, that made them feel depressed, and that made them feel anxious. Participants were encouraged to respond in any way they felt most comfortable, either by making lists, drawing pictures, writing words, phrases, poems, or stories. They were given approximately 10 minutes to complete this activity and were then asked to share their responses with the larger group. A complete list of questions used in the focus
group can be found in the appendix, but examples include: *What are stress, depression and anxiety?*, *What are some principal concerns in the community?* and *What are some major causes of stress in your life?*

**Qualitative Analysis**

Audio recordings of the focus groups were transcribed in the original Spanish by the research assistant in attendance, who was a local resident and native Spanish speaker. The transcriptions were then translated into English by the researcher and a native Spanish-speaking assistant before being imported into TAMSAnalyzer 4.34b5 (Weinstein 2011), a qualitative analysis software package for Macintosh computers.

The transcripts were examined for passages referring to feeling stressed, depressed and anxious or that made reference to symptoms that corresponded to the HSCL-24 symptom domains and were coded according to the appropriate categories. References to symptoms corresponding to symptom dimensions of the HSCL-24 were also coded into the appropriate categories. The HSCL defines each of these domains according to standardized symptom clusters. Table 3 shows the symptoms clusters for each domain.

**Table 3: The domains of anxiety, depression and stress as defined by the HSCL and the corresponding symptom clusters.**

<table>
<thead>
<tr>
<th>Domain</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>Restlessness, nervousness, tension, trembling</td>
</tr>
<tr>
<td>Depression</td>
<td>Loss of interest in thing one usually enjoys, loss of vital energy, feeling tired, feelings of hopelessness and futility, trouble falling or staying asleep, feeling trapped or caught</td>
</tr>
<tr>
<td>Stress</td>
<td>Headaches, backaches, feelings tense in the neck and shoulders, pain, discomfort.</td>
</tr>
</tbody>
</table>
After the initial coding process, sub-codes were developed within each domain to represent participants’ experiences, definitions, conceptualizations and events associated with each domain. These codes were then examined by TAMSAnalyser to identify the most salient stressors in the community, which domains these stressors were associated with, and how the domains of stress, anxiety and depression were described and experienced in the community. The most frequently mentioned stressors and the context in which these stressors occurred in their lives (e.g., at home, at work) were used to create the 30-Day Stress Scale.

The results from this initial analysis showed that the salient stressors could be classified into the categories of substance abuse and violence, economic stressors, work/home life stressors, and illness related stressors. Most salient stressors were used to create an 11-item scale. Each item on the scale was contextualized using the most common culturally based scenarios in which each stressor might occur. For example, a very common stressor was not having enough money. This stressor occurred in a variety of scenarios, but was most often associated with a feeling of stress and anxiety about not being able to pay the monthly bills. Therefore, rather than asking about a general shortage of household funds, this item was phrased with reference to not being able to pay monthly bills. This approach is consistent with other phenomenological approaches in anthropology (Csordas 2002; Lende 2005), and allows us to examine both the frequency with which this stressor occurs, and the subjective experience of these events at the individual and cultural levels.
**Scale Analysis**

The validity and reliability of the researcher-developed scale was tested using the Cronbach’s alpha statistics. Spearman’s rho correlation was used to determine how well the researcher designed scale (30DSS) correlated with the PSS (PSSScr), the HSCL-24 (HSCLScr) and Food security status (HFIAS Score). The Cronbach’s alpha and Spearman’s rho scores were calculated using SPSS quantitative data analysis software, version 18.

**Interviews**

Formal and informal interviews were used to gather additional qualitative information and explore the cultural domains of stress, anxiety and depression, as well as gather more contextual information on salient stressors. Convenience and random sampling methods were employed for formal interview recruitment (Bernard 2006). A random number generator was used to select participants from the longitudinal study, and participants taking part in the survey portion of the study were asked if they would like to be interviewed. In all, 10 in depth interviews were conducted; eight in people’s homes, the others in places of convenience for the participants. Interviewees were compensated $5 in cash for their time. All formal interviews were recorded, and names and places of employment used in this text are pseudonyms.
Participant Observation

Participant observation took several forms. In addition to participating in community events, the researcher also volunteered to help plant corn and rice crops with a study participant at a local farm in San Luis. Participating in community events such as a community-wide rummage sale, distributing water to runners in the 10 km community run, and participating in the farmer’s market helped to build rapport in the community and gain insight into daily life in the Monteverde Region. This contact with the community also presented opportunities to explore further, through informal interviews, themes from that emerged from the focus groups and interviews. Likewise, participating in farm work offered the researcher a firsthand experience into agricultural and subsistence living, and provided further context for comments made during the interviews. A pocket sized spiral notebook was used to write down observations and quotes in the field, and a small digital camera capable of recording video was used to capture photographs and video of the study locations.

Quantitative Data

Quantitative data consisted of two psychometric instruments, the Household Food Insecurity Access Scale (HFIAS), and the researcher developed scale. The Hopkins Symptom Check List (HSCL-25) is a well validated and widely used inventory of anxiety and depressive symptoms (Hadley and Patil 2008). This instrument is structured as a self-report symptom inventory comprised of 25 items representative of the symptom configurations most commonly observed among psychiatric outpatients. Items on this
checklist focus on the symptom dimensions of anxiety and depression. The HSCL-25 has been used in validated in many countries world wide, and has been used specifically in Latin America (Barthauer and Leventhal 1999). However as local dialects of Spanish vary greatly within Latin America, this version was translated into Costa Rican Spanish with the aid of a local psychologist working with the study. In addition to reviewing the translation, the content of the scale was also reviewed for cultural sensitivity. For example, as the researcher is a male and a majority of the study population female, an item dealing with sexual performance and desire was omitted from the final scale to remain consonant with local norms shunning conversation about sexual matters with members of the opposite sex. Participants were instructed to rate how often they experienced each symptom on a four-point scale (1-4) of as follows: 1=\textit{nunca} (never); 2=\textit{casi nunca} (almost never); 3=\textit{a veces} (sometimes); 4=\textit{frecuentemente} (frequently) using a time referent of seven days, e.g., “how have you felt during the past seven days including today?” (Derogatis, et al. 1974).

The Cohen Perceived Stress Scale (PSS) (Cohen, et al. 1983), in another widely used instrument that measures the degree to which an individual finds events in their life stressful. The PSS is a 10-item that asks respondents to rate on a 5-point scale questions designed to assess how unpredictable, uncontrollable and overloaded respondents find their lives (Cohen, et al. 1983). An existing Spanish version of the PSS (Ridley, et al. 1988) was reviewed by a native Costa Rican psychologist hired as a research assistant to ensure language and cultural compatibility with the dialect.

The Household Food Insecurity Access Scale (HFIAS) (Coates, et al. 2007) is a widely used instrument used to assess physical and economic access to foods, feelings of
uncertainty and anxiety over food availability and quality, and a reduction of food intake at the household level. Typically, the HFIAS is administered to the head of household, defined as the primary economic provider for the household, using a time referent of 30 days. A Costa Rican Spanish translation of HFIAS is being used in the area as part of in the parent longitudinal study (NSF #BCS0753017). To ensure that the food security data was current, the HFIAS was administered as a part of the data collection for this study in addition to previous HFIAS data that may exist as part of the longitudinal study.

Measuring food insecurity

Food insecurity is a complex and multidimensional phenomenon that has presented an ongoing challenge to researchers (Pinstrup-Andersen 2009). Because of its complexity, most measures of household food insecurity have been technically difficult, data intensive, and costly to employ (Coates, et al. 2007). The Household Food Insecurity Access Scale (HFIAS) was developed in an attempt to streamline the data collection process which still maintaining a scientifically useful measure of food security status (Coates, et al. 2007). The HFIAS is based on the idea that food insecurity results in predictable reactions and response that can be quantitatively assessed through a survey of items representative of those outcomes (Coates, et al. 2007).

The times on the HFIAS are based on a survey of how low-income households in the U.S. experienced food insecurity (Hamilton, et al. 1997; Radimer, et al. 1990; Radimer, et al. 1992; Wehler, et al. 1992; Wilde 2004). This review showed that food insecurity is experienced in the following ways (quoted from (Coates, et al. 2007):

• Feeling of uncertainty or anxiety over food (situation, resources, or supply)
• Perceptions that food is of insufficient quantity (for adults and children)
• Perceptions that food is of insufficient *quality* (inclusive of dietary diversity, nutritional adequacy, preference).
• Reported *reductions* of food intake (for adults and children).
• Reported *consequences* of reduced food intake (for adults and children); and.
• Feelings of *shame* for resorting to socially unacceptable means to obtain food resources.

The HFIAS was then field validated in the U.S. and cross culturally in developing nations (Coates, et al. 2003; Becquey, et al. 2010) and were shown to correlate strongly with existing indicators of poverty and food consumption (Coates, et al. 2007). The resulting scale is a nine-item measure designed to detect household food insecurity in three different domains: Anxiety and uncertainty about the household food supply; insufficient quality (inclusive of variety and preference of type of food); and insufficient food intake and its physical consequences. The questions represent more or less universal aspects of food insecurity, but are reviewed by key informants and adapted where necessary to reflect specific cultural markers and to insure linguistic compatibility (Becquey, et al. 2010).

Table 4 shows the questions from the HFIAS. Question 1 deals anxiety and uncertainty over the household food supply; questions 2 – 4 deal with insufficient quality, dietary diversity and preferences of food 5; questions 5 – 9 deal with insufficient food intake and its physical consequences. Respondents are given a time referent of 30 days and first asked an occurrence question (e.g. *In the past 30 days, did you worry that your household would not have enough food?*) and marked 0 for no and 1 for yes. If the respondent answers yes, they are asked as to the frequency this occurred (1=Rarely, once or twice in the past four weeks; 2=Sometimes, three to four times in the past four weeks; 3=Often, more than ten times in the past four weeks).
Table 4: The 9 items of the HFIAS (Coates, et al. 2007).

<table>
<thead>
<tr>
<th>No.</th>
<th>Occurrence Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>In the past four weeks, did you worry that your household would not have enough food?</td>
</tr>
<tr>
<td>2.</td>
<td>In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?</td>
</tr>
<tr>
<td>3.</td>
<td>In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?</td>
</tr>
<tr>
<td>4.</td>
<td>In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?</td>
</tr>
<tr>
<td>5.</td>
<td>In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?</td>
</tr>
<tr>
<td>6.</td>
<td>In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?</td>
</tr>
<tr>
<td>7.</td>
<td>In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?</td>
</tr>
<tr>
<td>8.</td>
<td>In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?</td>
</tr>
<tr>
<td>9.</td>
<td>In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?</td>
</tr>
</tbody>
</table>
Food security status is then determined by using the criteria outlined in Table 5.

**Table 5: Criteria for HFIAS categories** (Coates, et al. 2007)

<table>
<thead>
<tr>
<th>HFIA category</th>
<th>Criteria for HFIAS categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Calculate the Household Food Insecurity Access category for each household. 1 = Food Secure, 2 = Mildly Food Insecure Access, 3 = Moderately Food Insecure Access, 4 = Severely Food Insecure Access</td>
</tr>
</tbody>
</table>

- HFIA category = 1 if $[(Q1a=0 \text{ or } Q1a=1) \text{ and } Q2=0 \text{ and } Q3=0 \text{ and } Q4=0 \text{ and } Q5=0 \text{ and } Q6=0 \text{ and } Q7=0 \text{ and } Q8=0 \text{ and } Q9=0]$ |
- HFIA category = 2 if $[(Q1a=2 \text{ or } Q1a=3 \text{ or } Q2a=1 \text{ or } Q2a=2 \text{ or } Q2a=3 \text{ or } Q3a=1 \text{ or } Q4a=1) \text{ and } Q5=0 \text{ and } Q6=0 \text{ and } Q7=0 \text{ and } Q8=0 \text{ and } Q9=0]$ |
- HFIA category = 3 if $[(Q3a=2 \text{ or } Q3a=3 \text{ or } Q4a=2 \text{ or } Q4a=3 \text{ or } Q5a=1 \text{ or } Q5a=2 \text{ or } Q6a=1 \text{ or } Q6a=2) \text{ and } Q7=0 \text{ and } Q8=0 \text{ and } Q9=0]$ |
- HFIA category = 4 if $[Q5a=3 \text{ or } Q6a=3 \text{ or } Q7a=1 \text{ or } Q7a=2 \text{ or } Q7a=3 \text{ or } Q8a=1 \text{ or } Q8a=2 \text{ or } Q8a=3 \text{ or } Q9a=1 \text{ or } Q9a=2 \text{ or } Q9a=3]$ |

The simplicity of the scale and its cross culturally validity, combined with its attention to perceptions of food access, and feelings of shame, uncertainty and anxiety of food security status made the HFIAS a rational choice to complement the mental wellbeing measures used in this study.

**Measuring Stress**

As the concept of food security includes a person’s perceptions about food quality, desirability and future food supply (Coates, et al. 2006; Maxwell and Frankenberger 1992; Pinstrup-Andersen 2009; Weaver and Hadley 2009; Whitaker, et al. 2006), the incorporation of psychometric instruments into studies on food security has the
advantage of capturing the subjective experience of food insecurity. Therefore the following psychometric instruments were employed.

The Hopkins System Checklist (HSCL) is a self-report symptom inventory comprised of 90 items representative of the symptom configurations most commonly observed among psychiatric outpatients. Checklist items are organized into five symptom dimensions (table 6) associated with overall psychosocial stress: somatization, obsessive-compulsive, interpersonal sensitivity, anxiety and depression (Derogatis, et al. 1974). This section provides an overview of the clinical definitions of these primary symptom dimensions, scoring of the HSCL, and cross-cultural validity for possible application in anthropological studies.

The Hopkins Symptom Checklist was developed in 1965 as a criterion for measure in psychotropic drug trials (Derogatis, et al. 1974). The initial instrument was much larger and designed to measure a wide variety of emotional and physiological responses to psychotropic pharmaceuticals. Through clinical-rational clustering and empirical-analytic factor analysis, symptoms and responses were aggregated to produce a 90-item instrument. These 90 items were then assigned to homogenous clinical clusters based on consultation with highly experienced practicing clinicians. These 90 items and the five dimensions were normalized through tests conducted on 2,500 subjects, 1,800 psychiatric outpatients and 700 controls. Results of the study showed a high level of agreement in both the discrete symptoms of the inventors and the primary symptom dimensions (Derogatis, et al. 1974). Today the HSCL is primarily used as an outpatient symptom measure in psychiatric clinical practice.
The 90 items of the HSCL are organized into five symptom dimensions. Participants are instructed to rate themselves on a four-point scale (1-4) of distress. Typically, the patient is given a time referent of seven days, e.g., “how have you felt during the past seven days including today?” (Derogatis, et al. 1974). Scores for each dimension and the entire test are totaled and compared with standardize z scores by the clinician.

<table>
<thead>
<tr>
<th>Symptom dimension</th>
<th>Dimension definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somatic Expression</td>
<td>Distress arising from perceptions of bodily dysfunction. Symptoms associated with cardiovascular, gastrointestinal, and respiratory; pain localized in the gross musculature.</td>
</tr>
<tr>
<td>Interpersonal sensitivity</td>
<td>These symptoms focus on feelings of personal inadequacy and inferiority, particularly in comparison to other people. Self-deprecation, feelings of uneasiness of marked discomfort in the company of others.</td>
</tr>
<tr>
<td>Depression</td>
<td>These items deal with symptoms of dysphoric mood and affect, lack of motivation and vital energy, feelings of hopelessness and other cognitive correlates.</td>
</tr>
<tr>
<td>Anxiety</td>
<td>Items in this dimension detect symptoms associated with clinically high manifest anxiety:</td>
</tr>
</tbody>
</table>

Cross Cultural Validity

The psychological stress model traditionally focuses on an organism’s perception of stress, arguing that events negatively influence only those persons who deem them stressful (Cohen, et al. 1995). While it is true that culturally specific causes of stress exist, testing for somatic expressions of stress of have been shown to have a high degree of universality (Derogatis, et al. 1974) The goal of the HSCL is not to delineate the causes of stress, but rather assess the severity of the symptoms these events generate.
Repeated testing of both the HSCL-58 and the abridge HSCL-10 in European (Derogatis, et al. 1974), Latin American (Barthnauer 1999), and Middle-Eastern (Syed, et al. 2008) cultures have resulted in a high degree of concordance, thus illustrating the construct validity of both the primary dimensions and the discrete items (Derogatis, et al. 1974; Syed, et al. 2008).

This study used a 24-item checklist that has been adapted into Costa Rican Spanish with the aide of a Costa Rican psychologist familiar with the longitudinal study. The Cohen Perceived Stress Scale (PSS) (Cohen, et al. 1983) was used to measure the degree to which an individual finds events in their life stressful. The PSS is a 10-item measure that is widely used in research in cross-cultural settings. Respondents are asked to rate on a 5-point scale questions designed to assess how unpredictable, uncontrollable and overloaded respondents find their lives (Cohen, et al. 1983). The Spanish versions of the PSS have been validated in Mexico and Central America (Levenstein, et al. 1993; Remor 2006), and were checked by local native speakers for use in Costa Rica.

Quantitative Analysis

In addition to descriptive statistics, this study makes use of principal component analysis to examine underlying themes in the 30-Day Stress Scale, and Cronbach’s alpha to test the validity and reliability of the scale. Principal component analysis (PCA) is a statistical method that is often used when creating psychometric scales because of its ability to aggregate large numbers of variables into a smaller number of components (Field 2011). PCA creates a correlation matrix to establish which linear components exist within a data set and how a given variable might contribute to that component. This has
the end result of allowing the researcher to see underlying themes that may exist in the data by examining the correlation dynamics among different variables (Field 2011).

Based on these linear relationships, PCA groups common variables in a dataset together into common components based on the strength and orientation (either positive or negative) of the correlations. PCA examines which linear variables covary together and how a given variable might contribute to a component. Pearson’s r correlation and multivariate linear regression were used to explore the relationship between food insecurity and mental wellbeing. The HFIAS scores were used as the dependent variable, with the calculated scores for the HSCL-24, PSS, and the researcher-developed scale as the dependent variables. Additionally, the individual items of each of the psychometric instruments were used as independent variables in a regression model to further elucidate the affects of food insecurity on individual symptoms, experiences and stressors. All quantitative tests were conducted with an alpha value of .05.

*Previous Geographical Information System research*

In an earlier study of which this research is a based upon, Himmelgreen and colleagues (2006) identified several predictors for food insecurity in this population, including: not being a member of a food cooperative, not having a working stove, and increasing body mass index (see table 2 Chapter 2). Geographical coordinates of the study households were collected in the summer of 2010 to create a map of household food insecurity status in the area, and to determine if distance from the center of the tourism hub of Santa Elena was an additional predictor of food insecurity. Longitude and latitude coordinates were collected using a handheld GPS receiver and a standard walkabout method and were entered into the parent SPSS database and ArcGIS for
analysis. Spatial analysis was conducted in ArcGIS to identify geographical patterns of food security, and linear regression was conducted in SPSS 19 to determine if distance from the center of town predicted higher levels of food insecurity.
Chapter 6: Quantitative Results

The quantitative portion of this study was carried out over two separate field sessions spanning the summers of 2010 and 2011. The geographical positions of each of the participant households from the longitudinal study were collected in July and August 2010, with the food security and psychometric data collected from June to August 2012. All of the data presented here were collected from participants from the parent study population (Himmelgreen, et al. 2007). Participants were selected from the tourist-centered town of Santa Elena, the mixed agricultural/tourist town of Monteverde, and the mostly agricultural town of San Luis.

This chapter contains the quantitative results form the Household Food Insecurity Access Scale (HFIAS), the Hopkins Symptom Checklist (HSCL-24), the Perceived Stress Scale (PSS) and the 30 Day Salient Stress scale (30DSS). In addition to descriptive statistics, analysis of variance (ANOVA) was used to determine if any statistical differences existed among the three study sites in psychometric scores. Spearman’s rho correlation was used as an exploratory test to assess how well the results of the researcher-developed 30DSS correlated with the more widely used PSS and HSCL-24. Multilinear regression was used to determine if any of the variation in the psychometric scales could be explained by food security status, and linear regression was used to determine if spatial distance from the tourist center of town could explain any variation in food security status. Additionally, the results of the Cronbach’s alpha and factor analysis used to validate the 30DSS are also discussed in this chapter.
Exploratory Data Analysis

The subsample is comprised of 52 cases (4 males, 48 females) selected via random, convenience and snowball sampling methods from the parent study population. Table 7 shows the distribution of cases among the three towns.

Table 7: Number of participants from each town.

<table>
<thead>
<tr>
<th>Town</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monteverde</td>
<td>36</td>
</tr>
<tr>
<td>SanLuis</td>
<td>7</td>
</tr>
<tr>
<td>Sta.Elena</td>
<td>9</td>
</tr>
<tr>
<td>Total Valid N</td>
<td>52</td>
</tr>
</tbody>
</table>

Figure 6 shows that 72.3 % of the participants were married or in a civil union (common law union), 11.1% were single, and 9.4 % were separated, divorced or widowed.

Figure 6: Civil status of sample population.
Figure 7 shows the education distribution of the participants. Over half (53.7%) had completed primary and high school, and 7.4% had completed college. Conversely, nearly a quarter (22.2%) had not completed primary or high school.

![Educational Level Chart]

**Figure 7. Education level of sample population**

Analysis of HFIAS data shows a general trend of food insecurity in the sample, with just under half of the subsample experiencing some level of food insecurity. Table 8 shows the criteria for each food insecurity category.
Table 8: Definitions and criteria for the levels of food insecurity (Quoted from Coates 2007:19)

<table>
<thead>
<tr>
<th>Food security status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severely Insecure</td>
<td>A severely food insecure household has graduated to cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating), even as infrequently as rarely.</td>
</tr>
<tr>
<td>Moderately Insecure</td>
<td>A moderately food insecure household sacrifices quality more frequently, by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the number of and size of meals, but it does not experience any of the three most severe conditions.</td>
</tr>
<tr>
<td>Mildly Insecure</td>
<td>A mildly food insecure (access) household worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely.</td>
</tr>
<tr>
<td>Food Secure</td>
<td>A food secure household experiences none of the above conditions.</td>
</tr>
</tbody>
</table>
Figure 8 shows a percentage distribution of HFIAS categories. Nearly one quarter (23.08%) of the participants are experiencing mild food insecurity, nearly 14% are experiencing moderate food insecurity, and nearly 6% experiencing severe food insecurity.

Figure 8. Pie Chat showing the percentage distribution of FI categories in the study sample.
Food Security Distribution by town

Figure 9 shows the distribution of food security status in each of the towns. We can see the greatest amount of variation in food security status in Monteverde and the least in Santa Elena and San Luis. However, this variation may be due to the larger number of participants from Monteverde than from San Luis.

Figure 9. Percentage distribution of FI categories by each of the three study sites (N=52).
Scoring the Hopkins Symptom Checklist, the Perceived Stress Scale and the 30 Day Salient Stress Scale

Psychometric assessments are based on standardized scores that have typically been validated within the population in which they are used. Standardization of test scores requires that the test be given to a representative sample of the population. These samples are typically large and employ a random selection process to ensure that every member of the population has an equal chance of being selected for the standardization process. A statistical method of observation called a z-score is then calculated to establish a baseline to which individual scores can be compared. Using this method, a researcher is then able to compare one individual’s test scores to a baseline model of the population’s scores. As the HSCL-24 and the CPSS have not have tested in Costa Rica, standardized scores for comparison to the larger population do not exist. Therefore, z-scores were calculated for the sample population for each of the test scores to establish a basis for comparison within the sample. The following figures show the distribution of z-scores within each town.

Figure 10 shows Monteverde as having the lowest levels of perceived stress coupled with the most variation of scores. San Luis has slightly lower and the most variation of scores. Santa Elena has the highest levels of perceived stress.
Figure 10. Boxplot graphs showing the scores for the Perceived Stress Scale. The extended lines represent high and low end of the PSS scores per town. The shaded boxes show where the majority of scores fall town. The bold black lines inside of the boxes represent where 50% of the scores lie. The Y-axis shows the standard deviation of the standardized PSS scores, with .0 representing the computed baseline, or “normal” score for area. A higher standardized score indicates higher than normal perceived stress, the lower standardized score indicates lower than normal perceived stress. This graph indicates that more individuals in Santa Elena are experiencing higher than normal stress than in Monteverde and San Luis.

Figure 11 shows the distribution of symptoms measured by the HSCL by town. These results show more variation in the responses, but also show generally elevated scores with Santa Elena having more than 50% of the scores being significantly higher than those in Monteverde and San Luis.
Figure 11: Box plot showing the z score distribution of the HSCL scores.

Figure 12 shows the distribution of the 30DSS. These results show slightly lower scores in Monteverde and San Luis, and the highest scores in Santa Elena.
Figure 12. Box plots showing the z-score distribution of the 30 Day Stress Scale. These results show that approximately 25% of the scores in Santa Elena are significantly higher than those in the other two sites. Conversely, there is almost no significant difference between the scores in Monteverde and San Luis.

The Kolmogorov - Smirnov (K-S) test of normality was performed on the z scores and showed the 30 Day Stress Scale responses from Monteverde were significantly non-normal, which would skew the quantitative results. To compensate for this, an analysis of the data identified three outliers that were omitted and the K-S test rerun. The subsequent K-S shows significantly normal distribution of all test scores. In all, 47 cases were used in the Analysis of Variance (ANOVA) test.

ANOVA was used to compare the means of the standardized scores of the psychometric instruments. The results (table 9) show a significant difference between the
means of the Perceived Stress Scale (PSSScr) and the 30-Day Stress Scale (SS30dayScr), and a near significant difference in the HSCL-24 (HSCLScr) mean. This difference between the means suggest that these tests are detecting separate psychological phenomenon.

Table 9. Results of ANOVA examining the differences among the means of the psychometrics (N=47, p<.05).

<table>
<thead>
<tr>
<th>ANOVA</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zscore(PSSScr)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>5.435</td>
<td>2</td>
<td>2.718</td>
<td>3.512</td>
<td>.039</td>
</tr>
<tr>
<td>Within Groups</td>
<td>33.275</td>
<td>43</td>
<td>.774</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>38.710</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zscore(HSCLScr)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>4.874</td>
<td>2</td>
<td>2.437</td>
<td>3.086</td>
<td>.059</td>
</tr>
<tr>
<td>Within Groups</td>
<td>25.271</td>
<td>32</td>
<td>.790</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>30.145</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zscore(SS30dayScr)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between Groups</td>
<td>8.691</td>
<td>2</td>
<td>4.346</td>
<td>6.769</td>
<td>.003</td>
</tr>
<tr>
<td>Within Groups</td>
<td>28.249</td>
<td>44</td>
<td>.642</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>36.941</td>
<td>46</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Levene’s statistics showed that the means of the HFIAS, PSS and the HSCL-24 lacked heterogeneity when factored by town and would therefore not produce meaningful results in an ANOVA (this may be due to the small sample size and should not be regarded as a true representation of any homogeneity). However, the means of 30 Day Stress showed significant homogeneity among the means of the three towns and were examined in a second ANOVA. The second ANOVA results show that stress scores from Santa Elena are significantly higher than both Monteverde and San Luis (F=6.769, p<.05), though no significant difference was found between Monteverde and San Luis.

30 Day Stress Scale Validation

Cronbach’s alpha was used to test for internal validity and reliability. Cronbach’s alpha is a quantitative measure used to determine how closely related a set of
items are as a group (Field 2011). It is used in scale development to examine if a set of items on the scale is representing a single underlying theme (unidimensional latent construct). Typically an alpha <0.7 is a representative of unidimensionality. Table 10 shows the results of the Cronbach’s alpha, indicating a high level of internal consistency. The results of the Cronbach’s alpha indicated that nine of the 11 items showed very little variation among the responses (high unidimensionality), with the remaining two items (dealing with drug and alcohol abuse) showing slightly more variation among the responses (low unidimensionality). This could possibly be due to the combination of the small sample size and the socially sensitive nature of substance abuse causing people to under report their own experience with substance abuse. However, due to the ethnographic significance of substance abuse, and because omitting these items only raised the alpha by .005, they were retained for this analysis.

Table 10. Results of Cronbach’s Alpha

<table>
<thead>
<tr>
<th>Reliability Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cronbach’s Alpha</td>
</tr>
<tr>
<td>.985</td>
</tr>
</tbody>
</table>

Principal components analysis (PCA) was used to test how well individual responses to the items on the scale corresponded to one another relative to the entire study population, and to provide a point of comparison with the item categories culled from the focus group data. Kaiser normalization was used for the factor extraction criterion with Varimax orthogonal rotation. Kaiser normalization is considered a more conservative criterion for factor extraction (Jolliffe 1972), and was used to balance the attempts of the Varimax rotation to maximize the dispersion of variables within factors.
This combination can be used with smaller numbers of variables to provide a more interpretable cluster configuration (Field 2011). The PCA will examine which items in the scale group together based on the similarity of responses. These groupings can then be examined in relation to the qualitative data to identify underlying themes.

Table 11 shows the results of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and the Bartlett’s test of Sphericity. A KMO is an index used to determine if a PCA will be useful for analysis of the data based on the sample frequency and distribution. Typically a KMO value between .05 and 1 signifies that a PCA can be used (Hutcheson and Sofroniou 1999). The results of the KMO verified the sampling adequacy for the analysis (KMO = .622), which is above the acceptable limit of 0.05 for the analysis. The Bartlett’s test of Sphericity shows a significant result ($\chi^2$ 193.821, p< .001), indicating that all the correlations in the matrix are significantly large for this factor analysis. These two measures indicate that the data is suitable for PCA analysis.

In order to determine how many components to use in the PCA, an initial analysis was run to obtain eigenvalues for each of the components. Eigenvalues are a composite measure of the bivariate distribution, and are measured in this test by their Kaiser value. Generally speaking, the Kaiser value is an indicator of how much variance is explained by the eigenvalues in the model. Kaiser values between 0.7 and 0.8 are considered viable for factor analysis, with values >1 considered excellent as they explain more of the variance (Field 2011). Table 12 below shows that four components returned a Kaiser value of 1, and explained 70.8 % of the variance; these were obtained for the final analysis.
Table 11: Results of KMO and Bartlett’s Test

KMO and Bartlett’s Test

| Kaiser–Meyer–Olkin Measure of Sampling Adequacy. |  .622 |
| Bartlett’s Test of Sphericity | Approx. Chi-Square | df | Sig. |
| | 193.821 | 55 | .000 |

Table 12: Eigenvalues obtained from the initial analysis. Four components displayed Kaiser values greater than 1.

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
<td>Cumulative %</td>
</tr>
<tr>
<td>1</td>
<td>3.754</td>
<td>34.126</td>
<td>34.126</td>
</tr>
<tr>
<td>3</td>
<td>1.319</td>
<td>11.993</td>
<td>60.985</td>
</tr>
<tr>
<td>4</td>
<td>1.080</td>
<td>9.821</td>
<td>70.807</td>
</tr>
<tr>
<td>5</td>
<td>.979</td>
<td>8.898</td>
<td>79.705</td>
</tr>
<tr>
<td>6</td>
<td>.599</td>
<td>5.450</td>
<td>85.155</td>
</tr>
<tr>
<td>7</td>
<td>.472</td>
<td>4.203</td>
<td>89.448</td>
</tr>
<tr>
<td>8</td>
<td>.415</td>
<td>3.776</td>
<td>93.224</td>
</tr>
<tr>
<td>9</td>
<td>.361</td>
<td>3.279</td>
<td>96.504</td>
</tr>
<tr>
<td>10</td>
<td>.263</td>
<td>2.392</td>
<td>98.895</td>
</tr>
<tr>
<td>11</td>
<td>.121</td>
<td>1.105</td>
<td>100.000</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

Table 13 shows the results of the factor loadings after rotation. The items from the 30 day salient stress scale that cluster on the same components suggest that component one represents stress dealing with domestic problems of substance and physical abuse; component two represents economic stress; component three represents work and home life stressors, and component four represents health and medical care stressors. These components correspond with the themes of stressors culled from the focus group data, which suggests that the scale is an accurate measure of salient stressors in this community.
Table 13: Factor analysis after rotation

<table>
<thead>
<tr>
<th>Stressor</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Drug abuse</td>
<td>0.777</td>
</tr>
<tr>
<td>Alcohol abuse</td>
<td>0.656</td>
</tr>
<tr>
<td>Domestic violence</td>
<td>0.803</td>
</tr>
<tr>
<td>Can’t pay bills</td>
<td></td>
</tr>
<tr>
<td>Not enough work</td>
<td></td>
</tr>
<tr>
<td>Can’t afford family food preferences</td>
<td></td>
</tr>
<tr>
<td>Work too hard at place of employment</td>
<td></td>
</tr>
<tr>
<td>Problems with children</td>
<td></td>
</tr>
<tr>
<td>Work too hard at home and place of employment</td>
<td></td>
</tr>
<tr>
<td>Illness in family</td>
<td></td>
</tr>
<tr>
<td>Trouble receiving medical attention</td>
<td></td>
</tr>
</tbody>
</table>

Correlation

Spearman’s rho correlation was used to determine how well the researcher-designed scale (30DSS) correlated with the PSS (PSSScr), the HSCL-24 (HSCLScr) and Food security status (HFIAS Score). Table 14 shows the results of the analysis indicating a positive correlation among all the psychometrics scores. The PSS and the HSCL-24 had the strongest correlation, followed by the researcher-developed scale and the HSCL-24. Food insecurity was most significantly correlated with the 30DSS scores. These data, in conjunction with the Cronbach’s alpha and the PCA, suggest that the 30DSS is an accurate measure of culturally salient stressors that trigger both perceptions of stress as measured by the PSS, and symptoms of depression and anxiety as measured by the HCSL-24. Further, these results also show that food insecurity and culturally based stressors are significantly related.
Table 14: Results of Spearman’s rho correlation.

<table>
<thead>
<tr>
<th></th>
<th>PSSScr</th>
<th>HSCLScr</th>
<th>SS30dayScr</th>
<th>HFIAS score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spearman’s rho</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>1.000</td>
<td>.669</td>
<td>.489*</td>
<td>.090</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.</td>
<td>.000</td>
<td>.000</td>
<td>.547</td>
</tr>
<tr>
<td>N</td>
<td>47</td>
<td>35</td>
<td>47</td>
<td>47</td>
</tr>
<tr>
<td>HSCLScr</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>.669</td>
<td>1.000</td>
<td>.555*</td>
<td>.075</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.</td>
<td>.001</td>
<td>HFIAS score</td>
</tr>
<tr>
<td>N</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>30DSS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>.489*</td>
<td>.555*</td>
<td>1.000</td>
<td>.351</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.001</td>
<td>.</td>
<td>HFIAS score</td>
</tr>
<tr>
<td>N</td>
<td>47</td>
<td>35</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>HFIAS score</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correlation Coefficient</td>
<td>.090</td>
<td>.075</td>
<td>.351*</td>
<td>1.000</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.547</td>
<td>.668</td>
<td>.014</td>
<td>.</td>
</tr>
<tr>
<td>N</td>
<td>47</td>
<td>35</td>
<td>48</td>
<td>49</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

In order to determine which stressors were correlated with food insecurity, a Pearson correlation was run using the items from the 30DSS and the log-10 converted HFIAS scores. The results show a significant positive correlation between the 30 Day Stress Scale and food insecurity ($r^2 = .351, p = .014$). Though a near significant positive relationship was found between food insecurity and the Perceived Stress Scale (PSSScr; $r^2 = .09, p = .547$) and the Hopkins Symptom Check List (HSCLScr; $r^2 = .075, p = .668$), the strength of the correlation was much weaker when measured by the PSS and the HSCL. These results suggest that the salient stress scale serves as a mediator between food insecurity and the symptoms of and perceptions of stress, depression, and anxiety.

**Regression**

Linear hierarchical entry regression was used in order to determine if increased food insecurity was causally linked to decreases in mental wellbeing. A K-S test of normality was run on the raw HFIAS scores and showed significant non-normality ($D =$...
.312, \( p<.001 \) in the distribution. A log-10 conversion has been shown to produce a normal distribution of data when the K-S values show a near normal distribution (Field 2011). Therefore, a log-10 conversion was performed in SPSS to transform the HFIAS scores that were then reexamined for normality. The converted HFIAS scores still showed significant non-normality \( (D=.356, \ p<.001) \), but showed a bimodal form. The distribution of the raw HFIAS scores was compared with the log-10 converted scores and showed that a majority of the participants had a food secure rating that corresponded with the mode below .20 on the log-10 scores, equivalent to a perfect food security score in the raw scores. Filtering out these scores \( (<.20) \) on the conversion produced a significantly normal distribution \( (D=.125, \ p>.05, \ df=33) \) that satisfied the assumption of normality for linear regression. To further increase the power of the regression model the items from the 30DSS dealing with stress stemming from drug and alcohol abuse that lowered the unidimensionality of the scale were omitted from the regression model. However, as these items were ethnographically significant, they should be retained in future research employing a larger sample size. However, as this regression model is sensitive to unidimensionality, they were omitted and new 30DSS and new z scores were calculated based on the remaining nine items. In all, 33 cases were included in the regression analysis.

The log-10 converted HFIAS scores were used as the dependent variable in linear regression model with the standardized z-scores from the PSS, the HSCL-24 and the 9-item 30DSS as the independent variables entered hierarchically. In this model (Table 15), food insecurity was found to be a significant predictor of stress that accounted for
62.8% of the variation in the 30DSS ($p<.05$, beta = .628). No other significant predictors were identified.

**Table 15: Results of linear regression model using the log-10 converted HFIAS scores as the dependent variable and the scores of the psychometric assessments as outcome variables (N=33).**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>.234</td>
<td>.050</td>
<td>4.702</td>
</tr>
<tr>
<td></td>
<td>Zscore(9-item 30DSS)</td>
<td>.148</td>
<td>.049</td>
<td>.470</td>
</tr>
<tr>
<td>2</td>
<td>(Constant)</td>
<td>.233</td>
<td>.050</td>
<td>4.623</td>
</tr>
<tr>
<td></td>
<td>Zscore(9-item 30DSS)</td>
<td>.170</td>
<td>.062</td>
<td>.539</td>
</tr>
<tr>
<td></td>
<td>Zscore(PSSScr)</td>
<td>-.037</td>
<td>.063</td>
<td>-1.15</td>
</tr>
<tr>
<td>3</td>
<td>(Constant)</td>
<td>.226</td>
<td>.050</td>
<td>4.491</td>
</tr>
<tr>
<td></td>
<td>Zscore(9-item 30DSS)</td>
<td>.198</td>
<td>.066</td>
<td>.528</td>
</tr>
<tr>
<td></td>
<td>Zscore(PSSScr)</td>
<td>.006</td>
<td>.073</td>
<td>.013</td>
</tr>
<tr>
<td></td>
<td>Zscore(HSCLScr)</td>
<td>-.092</td>
<td>.080</td>
<td>-1.149</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Log10HFIAsscore_plus1

A two-step analysis using linear regression was used to further explore how food insecurity becomes embodied as stress depression, and anxiety. In the first step, a linear regression model using forced entry was performed using the log-10 converted HFIAS scores as the dependent variable with the individual items from the 30DSS independent variables. This was done to determine which salient stressors were predicted by food insecurity.

Table 16 shows that food insecurity significantly predicts stress stemming from an inability to afford the family food preferences (beta = 63.4, $p<.05$). This shows that 63% of the variation in responses to this item can be explained by food insecurity status. This indicates a statically significant relationship between food insecurity and this stressor.
Table 16: Results of linear regression model using the log-10 converted HFIAS scores as the dependent variables and the items from the 30DSS as the outcome variables (N=33).

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>.043</td>
<td>.098</td>
<td>.437</td>
</tr>
<tr>
<td></td>
<td>re can't pay bills</td>
<td>.042</td>
<td>.058</td>
<td>.145</td>
</tr>
<tr>
<td></td>
<td>re alcohol in comm</td>
<td>-.057</td>
<td>.044</td>
<td>-.203</td>
</tr>
<tr>
<td></td>
<td>re illness in family</td>
<td>.037</td>
<td>.044</td>
<td>.131</td>
</tr>
<tr>
<td></td>
<td>re not enough work</td>
<td>.012</td>
<td>.054</td>
<td>.037</td>
</tr>
<tr>
<td></td>
<td>re drugs in comm</td>
<td>-.028</td>
<td>.049</td>
<td>-.091</td>
</tr>
<tr>
<td></td>
<td>re too hard at employ</td>
<td>-.031</td>
<td>.041</td>
<td>-.103</td>
</tr>
<tr>
<td></td>
<td>re receiving med. attent.</td>
<td>-.029</td>
<td>.053</td>
<td>-.087</td>
</tr>
<tr>
<td></td>
<td>re problems with children</td>
<td>.041</td>
<td>.064</td>
<td>.109</td>
</tr>
<tr>
<td></td>
<td>re afford family food preferences</td>
<td>.196</td>
<td>.077</td>
<td>.634</td>
</tr>
<tr>
<td></td>
<td>re domestic violence in comm</td>
<td>.030</td>
<td>.079</td>
<td>.070</td>
</tr>
<tr>
<td></td>
<td>work too hard at employ an in home</td>
<td>.007</td>
<td>.055</td>
<td>.021</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Log10HFIAScore_plus1

Table 17 shows the results of regression model using the symptoms of the predictor found above as the dependent variable and the symptoms of the HSCL-24 as the dependent variables.
Table 17: Results of the linear regression model using the salient stressor “an inability to afford the families food preferences” as the dependent variable and the items from the HSCL as the outcome variables.

Here are the coefficients for the regression model:

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>.898</td>
<td>1.002</td>
<td>.894</td>
</tr>
<tr>
<td></td>
<td>Being suddenly scared for no reason</td>
<td>.078</td>
<td>.479</td>
<td>.054</td>
</tr>
<tr>
<td></td>
<td>Feeling Fearful</td>
<td>-.102</td>
<td>.578</td>
<td>-.063</td>
</tr>
<tr>
<td></td>
<td>Dizziness</td>
<td>-.042</td>
<td>.650</td>
<td>-.026</td>
</tr>
<tr>
<td></td>
<td>Nervousness or shakiness inside</td>
<td>-.092</td>
<td>.475</td>
<td>-.068</td>
</tr>
<tr>
<td></td>
<td>Heart pounding or racing</td>
<td>-.114</td>
<td>1.168</td>
<td>-.155</td>
</tr>
<tr>
<td></td>
<td>Feeling tense or keyed up</td>
<td>.630</td>
<td>.484</td>
<td>.451</td>
</tr>
<tr>
<td></td>
<td>Headaches</td>
<td>.393</td>
<td>.457</td>
<td>.279</td>
</tr>
<tr>
<td></td>
<td>Spells or terror or panic</td>
<td>-.059</td>
<td>.491</td>
<td>-.030</td>
</tr>
<tr>
<td></td>
<td>Feeling restless</td>
<td>.200</td>
<td>.344</td>
<td>.159</td>
</tr>
<tr>
<td></td>
<td>Not being able to sit still</td>
<td>-.012</td>
<td>.281</td>
<td>-.009</td>
</tr>
<tr>
<td></td>
<td>Feeling low in energy</td>
<td>-.686</td>
<td>.433</td>
<td>-.513</td>
</tr>
<tr>
<td></td>
<td>Blaming oneself for things</td>
<td>-.162</td>
<td>.316</td>
<td>-.121</td>
</tr>
<tr>
<td></td>
<td>Crying easily</td>
<td>.505</td>
<td>.488</td>
<td>.417</td>
</tr>
<tr>
<td></td>
<td>Feeling lonely</td>
<td>.149</td>
<td>.512</td>
<td>.100</td>
</tr>
<tr>
<td></td>
<td>Feeling hopeless about the future</td>
<td>.053</td>
<td>.572</td>
<td>.033</td>
</tr>
<tr>
<td></td>
<td>Feeling blue</td>
<td>.758</td>
<td>.593</td>
<td>.538</td>
</tr>
<tr>
<td></td>
<td>Thoughts of ending one’s life</td>
<td>-.774</td>
<td>.675</td>
<td>-.335</td>
</tr>
<tr>
<td></td>
<td>Feeling trapped or caught</td>
<td>1.180</td>
<td>.533</td>
<td>.603</td>
</tr>
<tr>
<td></td>
<td>Worrying too much about things</td>
<td>-.842</td>
<td>.702</td>
<td>-.422</td>
</tr>
<tr>
<td></td>
<td>Feeling everything is an effort</td>
<td>.433</td>
<td>.294</td>
<td>.318</td>
</tr>
<tr>
<td></td>
<td>Feelings of worthlessness</td>
<td>-.1170</td>
<td>.721</td>
<td>-.562</td>
</tr>
<tr>
<td></td>
<td>Poor appetite</td>
<td>-.469</td>
<td>.416</td>
<td>-.254</td>
</tr>
<tr>
<td></td>
<td>Difficulty falling or staying asleep</td>
<td>-.600</td>
<td>.569</td>
<td>-.407</td>
</tr>
<tr>
<td></td>
<td>Feeling no interest in things</td>
<td>.236</td>
<td>.412</td>
<td>.149</td>
</tr>
</tbody>
</table>

a. Dependent Variable: re afford family food preferences

These results show that an inability to afford the family food preferences predicts the depressive symptom “Feeling trapped or caught” (beta=.603, p<.05).

A third regression was run to determine if food insecurity explained any of the variation in the results of the Perceived Stress Scale. Table 18 displays the results of the regression model using the PSS items as the independent variables. In this model, 11% of the
variation is explained by food insecurity causing the perception that there are too many problems to solve.

Table 18: Results of linear regression model using the log-10 converted HFIAS scores as the dependent variable and the items from the PSS as the output variables.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>-.036</td>
<td>.463</td>
<td>-.078</td>
</tr>
<tr>
<td></td>
<td>Do you feel that you can’t control the important things in your life?</td>
<td>-.030</td>
<td>.069</td>
<td>-.076</td>
</tr>
<tr>
<td></td>
<td>Do you feel nervous or tense?</td>
<td>.106</td>
<td>.055</td>
<td>.322</td>
</tr>
<tr>
<td></td>
<td>able to manage the changes in important things in life?</td>
<td>-.069</td>
<td>.070</td>
<td>-.222</td>
</tr>
<tr>
<td></td>
<td>confident to manage personal problems well</td>
<td>-.121</td>
<td>.078</td>
<td>-.348</td>
</tr>
<tr>
<td></td>
<td>Felt that things were going better than other times</td>
<td>.035</td>
<td>.055</td>
<td>.111</td>
</tr>
<tr>
<td></td>
<td>Trouble managing all the things you have to do</td>
<td>-.031</td>
<td>.047</td>
<td>-.099</td>
</tr>
<tr>
<td></td>
<td>Able to control you anger</td>
<td>.044</td>
<td>.066</td>
<td>.115</td>
</tr>
<tr>
<td></td>
<td>Angered by things you could not control</td>
<td>.007</td>
<td>.054</td>
<td>.018</td>
</tr>
<tr>
<td></td>
<td>Able to use time properly</td>
<td>.099</td>
<td>.062</td>
<td>.228</td>
</tr>
<tr>
<td></td>
<td>Felt there were too many problems to solve</td>
<td>.108</td>
<td>.052</td>
<td>.326</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Log10HFIAScore_plus1

Figures 13-15 show the response means of the items from the 30DSS from each of three towns. Figure 13 shows that the chief (salient) stressors in Santa Elena are working too hard both at home and at place of employment, drugs in community, not having enough money to pay bills, and not being able to afford family food preferences.
Figure 13: Chief stressors in Santa Elena
Figure 14 above shows the most salient stressors in the Monteverde were working too hard at the home and place of employment, not being able to pay bills, illness in the family, working too hard at place of employment, and not being able to afford the family food preferences.
Figure 15: Mean score of the chief stressors in San Luis.

Figure 15 shows that the chief stressors in San Luis are illness in the family, not being able to pay the bills, and not being able to afford the family’s food preferences, working too hard at place of employment and not having enough were of equal concern.

An ANOVA was conducted to determine if there were any significant differences between the means of the response scores among the three towns. The results showed no significant variation among the response in all but two of the items. Two stressors, (drugs in the community and working too hard at place of employment) had significantly higher means in Santa Elena than in Monteverde and San Luis ($P<.05$).

Geospatial Results
The longitude and latitude coordinates of the households from the parent study (N=200) were recorded using a Garmin csx60 handheld GPS received and the WGS 80 coordinate system. These coordinates were then entered into master SPSS file from the parent study to create a georeferenced database that could be used for spatial analysis. This database was then imported into ArcMAP for the spatial analysis.

Figure 16 shows a map of the study area and the food security status of the participants’ households. Each house is color-coded according to the level of food insecurity from the original SPSS file:

- Green: Level 0-food secure
- Yellow: Level 1-mildly insecure
- Orange: Level 2-moderately insecure
- Red: Level 3-Severely insecure
Figure 16: Map showing household locations and food insecurity status.

Spatial analysis was performed using the Getis-Ord statistical test to identify geographical clusters, or “hot spots” of food insecurity in the area. The Getis-Ord statistic is useful for identifying geographical clusters based on a given variable because
it identifies clusters of values based on geographical nearest-neighbor rather than Euclidian distance (Ord and Getis 1995). The Getis-Ord test creates standardized z-scores (called the GiZ score) based on the geographical nearest-neighbor concept to identify clusters of like-values in a given area. It looks at the individual value of a feature, in this case food security status, and the values of that feature’s nearest geographical neighbors. If a given feature’s value is relatively high, and the values for all of its neighboring features are also high, a hot spot of high values is identified. The local sum for that feature and its neighbors are then compared proportionally to the sum of all features. If the local observed sum is statistically different from the expected local sum, a statistically significant GiZ score is the result (Lo and Yeung 2007).

Distance from the center of Santa Elena was determined through the use of distance buffers generated in ArcMaps in 500 m increments from the center of Santa Elena out to 3 km (Figure 17). Distance buffers are used in spatial analysis to create boundaries in specified distances around selected features (Gesler 1986). Distance for a data point is then determined by its membership in a given buffer ring. Buffer rings were created to measure households at >500 m, 1000 m, 1500 m, 2000 m, and 2500 m from the center of Santa Elena. The 3000 m buffer did not contain any data points and was excluded from the analysis. Household membership in a specific buffer ring was entered into SPSS as a dummy variable and used as a covariate in a Linear regression model to determine if distance from Santa Elena predicted food insecurity.
Figure 17: GiZ scores in Santa Elena with buffer rings measuring 500m. Using the georeferenced data, the GiZ score for each household was computed based on the HFIAS score from the existing database. These scores were then divided into classifications based on the standard deviation (1.00) for the GiZ scores (Table 19).
Spearman’s rho correlation was used to determine if distance from Santa Elena correlated with the GiZscores. The results of a two-tailed Spearman’s rho show a positive correlation ($\alpha=.01$, $r=.417$) between the GiZ categories of food insecurity and increased distance from Santa Elena.

Linear regression was used to determine if distance from Santa Elena predicted food insecurity status. GiZscore results from the cluster analysis were used as the dependent variable with the measurements for each case derived from the distance buffers used as the outcome variables. The results of the regression analysis (Table 20) show a significant relationship ($\beta=.331$, $p<.001$) between increased levels of food insecurity status and increased distance from the center of town. However, the model also shows that the slope of the line in the unstandardized coefficients (B) show no significant change can be expected in the GiZ scores with change in the distance. The maps above show that a possible explanation may be found in the distribution of clusters of food insecurity. The maps show that food insecurity is localized to the south of Santa Elena, but the northern section remains fairly food secure. The maps show that distance
from Santa Elena may be more of a determining factor for food insecurity in south than in the North. Future analysis of this type could control for the individual towns to increase the accuracy of the statistical model, however, this finding helps to illustrate the role GIS technology can play in helping to understand spatial trends in social phenomenon.

**Table 20: Results of linear regression using the GiZscores as dependent the variables and the distance from the center of town as the outcome variables.**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>2.920</td>
<td>.076</td>
<td>38.239</td>
<td>.000</td>
</tr>
<tr>
<td>distance</td>
<td>.000</td>
<td>.000</td>
<td>.331</td>
<td>4.756</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Giz Score

**Summary**

The quantitative results show that the tourist hub of Santa Elena had significantly higher scores on the PSS, the HSCL-24 and the 30DSS than either Monteverde or San Luis. These results indicate that Santa Elena is experiencing more symptoms of depression and anxiety, and higher levels of perceived stress. The results of the regression analysis show that food insecurity was found to be a significant predictor of stress, accounting for 62.8% of the variation in the 30DSS ($p<.05$). Food insecurity was also found to explain 63% of the response variation for the salient stressor “not being able to afford the family’s food preferences” ($p<.05$), which was in turn found to explain 60% of the response variation for the HSCL –24 depressive symptom “Feeling trapped or caught”. Finally, distance from the tourist hub of Santa Elena was found to be a predictor of food insecurity. These results show that food insecurity does affect mental wellbeing independently of other political economic stressors, and that the salient stress scale is
robust to food insecurity-related stressors. Additionally, the findings from the spatial analysis point to a geospatial component of food insecurity that is consistent with ethnographic accounts citing transportation and distance to grocery stores as a contributing factor of food insecurity
Chapter 7: Qualitative Results

Focus Groups

A total of 26 individuals (8 men, 18 women) participated in three focus groups. A qualitative analysis of the focus group data identified several themes. Table 21 indicates the most frequently listed sources of stress from all three focus groups.

Table 21: The Frequency of stress themes from all three focus groups.

<table>
<thead>
<tr>
<th>Code</th>
<th>Sub Code</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic Stress</td>
<td>Debt</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Insufficient household</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>funds</td>
<td></td>
</tr>
<tr>
<td>Medical Stress</td>
<td>illness-self</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>illness-family</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>injury</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>access to healthcare</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Medical expenses</td>
<td>1</td>
</tr>
<tr>
<td>Work Stress</td>
<td>lack of opportunity</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>too little pay</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>loss of employment</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>intermittent employment</td>
<td>3</td>
</tr>
<tr>
<td>Social Stress</td>
<td>Family</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Child rearing</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>degradation of values</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Gender role-conflict</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Drugs</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Alcohol</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Domestic Violence</td>
<td>2</td>
</tr>
</tbody>
</table>

Cultural Definitions of Stress

The first question in each focus group: “What is stress, depression, and anxiety?” was designed to stimulate discussion that would help elucidate cultural perspectives on these topics in order to explore culturally based definitions of these phenomenon. A
pattern emerged among all of the focus groups where several of the participants would indicate they did not know what stress was. The term *preocupaciones*, which translates literally into English as “worries” or “concerns,” emerged as cultural synonym for *el estrés*. Once this domain had been identified, participants used *preocupaciones* and *estrés* interchangeably throughout subsequent discussion. Other names that were mentioned were *tristeza* (sad), and *ostinadación*, described as experiencing a feeling of irritability and annoyance, or “having had enough” of something.

*Perceptions of Stress, Depression and Anxiety*

The emotional aspects of stress, depression, and anxiety were the first theme to emerge in discussion. Stress was described as a feeling of constant concern, worry and a lack of resolve surrounding events in one’s life. This was often coupled with a lack of control over these events. People reported that when they felt powerless to change events, they became stressed. One participant defined stress as a “feeling that comes when you can’t control [a] situation” another elaborated, “stress is when too much happens to you too fast and you can’t do anything to stop it.” Others described it as having “problems that you can’t solve.”

Although stress, depression, and anxiety were asked about separately, many participants described them in relationship to one another. They all agreed that they were separate phenomenon, but could in severe cases have so much in common that they could be synonymous with one another. When described in relation to one another, they were described as varying intensities of a single phenomenon. For example, one participant described *preocupaciones* as a disease where:
“Concern turns to worry, then worry starts the process of the illness, and if you don’t catch it in time, it turns into stress, then anxiety, then depression. It’s like a mental disease, but it can make you physically ill too. You begin to get headaches, and the tension in your back and shoulders; soon it spreads to your stomach and affects your sleep; that is depression. Worry causes stress, stress causes depression, and depression is the disease.”

Others echoed the sentiment that these were a holistic phenomenon affecting the mind and the body; one a woman in her early 40’s, the single mother of two children even added a spiritual dimension:

“I think that stress, depression and anxiety affect the mind body and spirit. I agree with what you all are saying that it’s like a disease, but I think there is a spiritual side, too. When we worry too much, the object of our worry takes up too much of our attention, and we can’t focus on the things that make us happy, the things that really matter. When that happens, it affects our spirit. Depression is the next stage in the disease, I agree, but I think that at that point it begins to affect our spirit, too; so it’s a mental disease, yes, and it affects our bodies, as you say [gesturing to another member of the focus group], but it also affects our spirit, and I think we overlook that sometimes...at that point, you begin to lose yourself.”

The next theme to emerge was physical symptoms of stress, depression, and anxiety. Stress was characterized as tension in the shoulders, headaches, stomachaches, and feelings of lethargy. People noted that when they are stressed for too long, that it begins to affect their cognitive function. They reported feeling forgetful, moody, feeling easily distracted and making absent minded mistakes. Behavior was also affected. People noted that they were more likely to be short tempered, withdrawn, and make hasty decisions when there were stressed. Sleep was also affected by stress, which exacerbated
the existing symptoms of stress. Participants said that despite begin tired, they generally
did not sleep well when they were stressed, which compounded the problems. One
participant, recently divorced woman in her late 30’s and mother of two living and
working in Cerro Plano, explained:

“When you are stressed, you have pains in your back and in your
shoulders and in your jaw, and you feel so [tenses shoulders and
face to mime feeling tense and in pain] and then you don’t sleep
well and then you wake up tired, and that just makes everything
worse… there is no break when you are stressed and tired, the kids
still need to go to school, I still have to go to work … everything is
harder when you are stressed, it’s like there’s no way out.”

\textit{Depresion} (being depressed) was characterized as feeling intense sadness,
loneliness, feeling tired for no reason, “losing the ability for joy” and losing control of
one’s emotions. Depression was said to be related to, and caused by, the cumulative
effects of chronic stress, but could also be the result of more direct causes, such as the
tragic loss of a loved one. \textit{Deprimido} was used to talk about the state of being depressed
or having feelings as described above; however, \textit{depresión} was also used when talking
about depression as a general topic, but the two were not used interchangeably.
\textit{Desesperación} (desperation) was given as a synonym for depression, and \textit{el triste} (the
sadness) was described as a folk illness befalling someone who has been chronically
depressed and convalesced for an extended period of time. In contrast to stress being
described as a loss of control over events, depression was described as losing control of
one’s emotions. Participants reported frequent uncontrolled crying, and an inability to
find joy in activities that once made them happy. One participant described it as “not just
losing joy, or not being happy or being sad, those are normal, but actually losing the
ability to experience joy.”
Anxiety was characterized by the group using many of the same symptoms they experienced with stress and depression: loss of control, feeling impatient, uneasy, moody, easily distracted, unable to focus, and feeling constant worry. *Ansiedad* (anxiety) or *ansioso* (anxious) were used almost exclusively to refer to this feeling. Anxiety was described as a being worried about something, but having control over it. As one participant put it, “stress comes from things you can’t control, but with anxiety, you still have control. Like, you can be anxious about taking a test, or meeting new people, but you can do these things. It causes stress, but you still have control.”

*Themes of Stress, Depression, and Anxiety*

Analysis of the focus group data reveals the most salient stressors the participants’ lives fall into four categories, which are outlined below. An examination of these stressors and the categories reveals insight into how stressors are perceived and embodied as both distinct and interconnected phenomena. These findings suggest that stress, like food insecurity, is multidimensional and capable of being indexed as a discrete domain (for example “economic stressors”) but that are also embodied as complex and interrelated with other stressors (substance abuse and work/home life stressors). This next section presents these categories with examples from the interviews of the discrete stressors and how they interrelate.

*Category I Stressors: Economic uncertainty and Job Scarcity*

The first category reflected stress over job scarcity and employment insecurity, and was the most prevalent source of stress recorded in all three focus groups. Stressors
in this category were specifically contextualized to issues surrounding a lack of available jobs, a lack of good paying jobs, and a having to work long hours at jobs that do not provide sufficient income to meet the household budget demands. The tourism industry is the chief source of income for many residents of the Monteverde Region, and residents of the area interviewed report that it has been on the decline over the past two years in the wake of the global economic crisis. Many tourism-based businesses have closed, laid-off personnel, or enacted pay cuts, leaving many residents without jobs or with insufficient incomes. Some have taken second jobs to try and make ends meet, but as one woman in her 40’s living in Cerro Plano noted, it may not be enough:

“...I had to get a job at a hotel when my husband was laid off. People say there are no jobs, but there is work here, but it doesn’t pay enough to cover our costs. I work two jobs seven days a week and it’s not enough. And plus, I get tired. Sometimes I think I just can’t do it anymore, but then I think, if I don’t, who will?”

As shown in table 21 above, the most salient stressor in the community is due to insufficient household funds, followed by a shortage of jobs in the community, and stress relating to child rearing. There are interrelated themes that reinforce one another. A women in her late 40’s and owner of a local restaurant said:

“There just aren’t that many tourists this year. We’re not making enough money to pay the bills. We’re even working Sundays now. I’m just waiting for the bank to come and take the keys [to the restaurant]. My son, he still works for me, but I had to cut my pay in order to give him more. He needs a job or he’ll be out getting into trouble. At least here I know he’s not getting into trouble.”

Similarly, another woman in her mid 30’s and mother of four school age children responded:

“It makes me want to cry when I go to the store knowing that I don’t have enough money to buy the foods that my kids want. I
feel like a horrible mother, like I’m letting them down. It’s not that we don’t have enough money to buy enough food, nobody in my house ever goes hungry [laughs], but I know they are tired of having only gallo pinto [a traditional Costa Rican meal consisting of rice, beans and spices] for lunch. They want chicken and they want some other kind of something, a sandwich or a sweet treat, you know? They don’t like the generic cereal, they want the one with the cartoons on the box, you know? And it makes me sad. I feel like I am always saying “no” to them when they see something they want. Sometimes I go to the store even when I know the money isn’t there, and I feel angry and I feel sad and I feel empty inside, you know? That I have to work so hard [she works two jobs] and I am very tired, but still we can buy only what we need, never what we want.”

This quote reflects the interrelated nature of stress, job scarcity, child rearing and food insecurity. This condition described here is the most prevalent form of food insecurity represented in this sample, HFIAS category one, “mildly insecure,” and is characterized by feelings of uncertainty or anxiety over the type of food, the food quality or food supply, and a feeling that food is of insufficient quantity or quality for adults or children (Coates 2007). Although the participant notes the fact that “no one in my house goes hungry,” speaking to the fact that there is a sufficient quantity of food in the house, her anxiety about food is focused on the symbolic or perceptual dimension of food – her family’s food preferences. This calls attention to the role that cultural prestige plays in food insecurity and mental wellbeing. Her children do not want to eat the generic cereal; they prefer the “in”, name brand cereals. This quote echoes the quantitative finding that there is a link between food insecurity, stress, and depression, and also resonates with the theoretical interpretation that perception is an embodied phenomenon. Here, food constitutes a Marxian objectification of the respondent’s consciousness, her character and her identity as a mother and the primary caretaker of the household as well, as serves an essential physical and material need. The exchange of food between her and her children
constitutes an embodied relationship as the money she earns is converted into the raw materials (ingredients) for the meals she prepares and gives to her children. Thus, the food is an objectification of her identity and her character, her *motherness*. As the children consume the food, according to Marx, they are nutritionally fulfilled and symbolically joined with her and nature, and should share in the enjoyment of this exchange: her from seeing them nourished and satiated by the physical and symbolic dimensions of the meal she prepared, and them by the enjoyment of its taste and satiability, and as a symbol of their mother’s affection; thus, she would have her identity as a mother confirmed. However, this relationship is constrained and mediated by the job scarcity and economic uncertainty in the tourism sector. While she has enough money to meet the nutritional and caloric needs of her children, she must do so with less desirable foods – the generic foods – that yield a less desirable and more homogenous (and even monotonous) diet. This has a direct affect on her consciousness as she reports feeling her children desire foods she is unable to provide, leaving her feeling “sad”, “empty” and “angry”, and unable to objectify her identity as a caring mother (“I feel like a horrible mother, like I am letting them down”).

*Category II Stressors: Quality of Life*

The second category contains items reflecting dissatisfaction with the quality of life at their work and home environments. Stressors in this category included problems with children and family members, having to work long hours at places of employment, coming home to a mountain of domestic chores, and working too hard for too little pay. Three of the women in the focus groups represented households undergoing a shift in
gender-related roles where women, who have traditionally been homemakers and performed domestic labor, are now taking on the additional task of either being the primary income provider, or are working to augment a reduced primary income (Preston-Werner 2008). Participants described their situations conforming to what Kahn and colleagues (1964) have called role-conflict, where the woman’s role as the primary homemaker is in conflict with, and strained by, the addition of her new role as the primary income provider. As one woman in her early 40’s put it, “…my whole life is work. I wake up, make breakfast, I get the kids ready for school, I go to work, and then I come and have to make dinner, clean up dinner, do the laundry and make sure the kids are ready for school. I work at work and I work at home…no one helps me.” Another participant, a single mother of four living in Monteverde offered:

“In my house, I am the mom and the dad. I’m the one who has to run to school meetings, I’m the one who has to go to school when Cilia [a pseudonym for the school counselor] calls and says there is a problem, I’m the one who has to leave work to do all of this. Thanks be to God that my kids are well behaved, but when they do get in trouble, who has to go answer for them [poner la cara]? Always the “mamá”. So if one of them gets into trouble, or is behind in a subject, that is something I have to deal with, and it takes away from work. …It’s a great worry for me.”

*Category III Stressors: Illness of the self or a family member*

The items included the third category reflect concerns stemming from illness of the self or family members and barriers to accessing healthcare. Costa Rica’s healthcare system is a mixed healthcare model, with nearly 90% of the country’s curative services provided for federally by *The Caja Costarricense de Seguro Social* (CCSS, Costa Rican Social Security Fund) via its 240 clinics and 29 hospitals (Clark 2004). The clinics, called *Equipos Básicos de Atención Integral de Salud*, or EBAIS, were distributed throughout
the country based on capitation in an effort to meet the physical, social, and psychological health needs at the community level. These clinics were designed as primary care facilities and are equipped with a doctor, a nurse, a dentist, a social worker, family practitioner, laboratory technician, and a pharmacist. However, they are not equipped for specialized care or diagnostic procedures. Patients requiring this secondary level of care are referred to either the second or third tier care (usually hospitals) (Clark 2004).

As participants note, this can be an arduous process. Many residents in the rural and mountainous region of Monteverde lack the transportation required to make the two-plus hour journey one way to the nearest tier-two hospital in Puntarenas, or the three-plus hour journey one way to the more advanced, tier-three hospital in San Jose. The additional costs associated with the travel (time off from work, fuel costs, overnight stays, etc.) add to the stress of the illness. Additionally, while these hospitals have recently begun to expand their facilities and staff to accommodate Costa Rica’s growing population, they remain largely understaffed (Clark 2004). Insufficient staff and facilities, coupled with the bureaucracy of the system create a bottleneck effect characterized by long waits of up to several hours for admission to a hospital, and even longer waits of several weeks or months for diagnostic procedures. The ethnographic accounts of these conditions presented here are consistent with those of Clark (2004) and Goldale (2009) and reflect a persistent problem for Costa Rica’s health care system. Further, diagnostic procedures may require several of these trips, multiplying these associated costs and prolonging treatment. An elderly wife of a farmworker, both whom
live and work in Monteverde, recounted a story about her husband’s struggle to get treatment for what turned out to be a life threatening condition:

“My husband had been getting very bad headaches for several months. We went to the EBAIS; they said they couldn’t help him there; that we had to go to [the hospital in] Puntarenas. So we had to borrow my brother’s car and take time off from work to go there. We waited all day to get in, and then waited more once we got inside. Then the doctor sees him and he says to come back in three weeks for some tests. So, we leave and a week goes by, and his headaches are getting worse, and they’re making him nauseous, and he can’t sleep, and we finally had to take him to a private doctor. The private doctor ran some tests and said he had an aneurism and needed treatment right away. We had to borrow money to do it, but it was worth it. The private doctor said he might not have lived another three weeks.”

Other participants offered similar stories recounting the additional costs associated with making several trips back and forth to hospitals. One woman in her late 40’s, living in Santa Elena, and who is the caretaker for her mother-in-law recounted:

“My mother in law is very ill, and they only have the medications she needs in Puntarenas, so we have to go there every month. Gas is too expensive, so we take the public bus, and we leave very early in the morning and get back very late in the evening. It’s a whole day every month to get her her medications, and then we’re very tired the next day at work.”

The EBAIS in Monteverde are staffed by fully qualified medical personnel, however, there is a perception in the community that because these clinics are in rural areas, they are given freshly minted medical doctors with little experience. As one key informant said:

“They [the doctors] are all first year medical residents, and the nurses are right out of nursing school. Sometimes we get a doctor who is older, but not too often. So sometimes they will just refer you to [the hospital in] Puntarenas just because they don’t know what you have, or they don’t have the medications there to treat you. It’s like, if you need anything more than an aspirin, you have
to drive two hours [laughs]! Then you get there [to the hospital] and the doctors there are like [gestures to show confusion] why did you come all the way here for this? So it’s a real problem, you know? It’s like we’re used to give them experience.”

This perception is not far from the reality however. As Clark (2004:202) notes, the rapid expansion of the EBAIS clinics during the 1990’s necessitated that they be staffed by new medical school graduates in order to consolidate the older doctors with more experience to the more intensive second and third tier hospitals.

This problem of inexperienced doctors is compounded for residents in the rural town of San Luis where the local clinic is staffed only one day a week. Residents in San Luis report that lack of transportation is a common barrier to accessing health care there. Some residents of the low-lying area often travel to Monteverde on a motorcycle or on foot, a difficult task considering the 1,300-meter difference in altitude between the two towns. Residents lacking transportation in San Luis are in a situation where they either must find transportation to the EBAIS in Monteverde or wait until the San Luis clinic is open. This can be especially hard on the elderly. As an elderly farmer and his wife living in San Luis recalled:

“I don’t like going to the EBAIS when she [his wife] is sick. I have to borrow my neighbor’s moto [dirt bike] or take my horse, and that road is rough, and she is already in pain […] That road makes it hard to get to the clinic, even more during the rainy season.”

This quote again shows how medical illnesses are interrelated with economic constraints. Ancillary costs accrued related to travel, time off from work to make repeated trips and deal with long wait times in hospital all magnify the existing stressors related to illness.
Category IV Stressors: Substance Abuse

The forth and final category reflected stress pertaining to the sale and use of illegal drugs, alcohol abuse, and domestic violence. Women in the focus groups reported drinking alcohol only occasionally, such as on special occasions, and not on a regular basis. Several women in the focus groups shared personal stories of physical or verbal abuse, and nearly all indicated they knew someone who had suffered from abuse. Often their stories involved the over-use of alcohol by the assailant; however, not all alcohol related stress was coupled with violence. Some women in the focus groups reported feeling stressed over the financial impact of their male partner’s drinking habits, noting an increase in their alcohol consumption despite the reduced income. A woman in her late 30’s and resident of Monteverde recalled: “It makes me angry that he spends money on beer when we’re worried about having enough money to pay the bills.”

Male participants also expressed concern about alcohol abuse in the community. All of the men in the focus groups reported that they drank alcohol, and all reported knowing at least one person in the community for whom drinking was a problem. One participant reported that it had been a problem for him in the past, but that he currently had it under control. The men were less apt to talk about personal alcohol use in the focus group setting, but when asked by the research team if they thought alcohol abuse was a problem in the community, the men agreed that it was, however, none of them reported feeling stressed over these problems. As one male explained: “If someone drinks too much it’s their problem, it doesn’t bother me.”
Not everyone share this sentiment, however. During a private interview, one male informant in is early late 40’s from Santa Elena shared how his daughter’s boyfriend’s drinking was affecting his family:

“I used to work in construction, but I don’t have a job right now. My wife works, and we save everything she makes so that we can pay the bills and so our children can go to school. We don’t drink, we don’t go out, and we don’t spend money on ourselves right now. Everything is for our children. My daughter, she is 19 years old, and she is not in college because we cannot afford it. She got a job so she could save for college, but she began dating this boy, and he is no good. …They live together, and she supports him. He has a drinking problem. He’s always out here on the corner hanging out at the pulperia [small corner market] doing nothing. Not working, just hanging out with his friends and looking suave [cool]. I see him drinking with his friends in the afternoon while my daughter is at work. So, who do you think it paying for that? Sometimes she calls me at night upset because maybe he is out too late and comes home drunk, but then he is very suave and will make up with her. Nothing changes. It all happens again, and I worry about her. It makes me angry that we are here sacrificing for our children, saving everything we earn for them, and this guy is spending her money to get drunk. He has such disrespect for her and my family.”

The sale and use of illegal narcotics was also a concern for members of the community. As Romero-Daza and Freidus (2008) has pointed out, adventure tourism in Monteverde is on the rise, and many tourist report adopting a “vacation mentality” characterized by a feeling of “decreased inhibitions and increased freedom from social constraints” (p.175). The tourists’ excessive alcohol consumption and demand for illicit drugs has had an affect on the lifestyles of the local residents. One interviewee in this study stressed that he suspects his son may be selling cocaine from a local bar:

“Cocaine is very cheap here. You can get a gram of cocaine for about twenty US dollars here. That is very cheap, and many, many US tourists come here and they want to have a good time, and they want the cocaine and they want the heroine, and they want the
marijuana. You can make a very good living off of selling cheap drugs to American tourists. Because many [of the tourists] are very young, maybe they cannot afford the cocaine in the States, and they want to try it and they are afraid to try it there [in the U.S.] because maybe they are afraid they will go to jail, and here they know it is not such a problem. So there are a lot of people who want drugs, and unfortunately there are a lot of people here without jobs who can make some money getting it for them. My son, he has no job, yet he has money. I don’t know where he gets it from, but I know they sell drugs down there [at the local bar], and he is down there a lot. I don’t think he uses them, but I think he is selling them, and it makes me very sad. I worry for him.”

Although none of the participants reported using illicit drugs, they all agreed that it was a growing problem and that is was associated with tourism. As one lifelong resident said, “We never had drugs in Monteverde when I was growing up. It’s only been in the last 10 or 20 years.”

In summary, the qualitative findings support both the quantitative findings, that food insecurity predicts depression, and the theoretical framework of food insecurity as a phenomenologically embodied concept. Both the ethnographic interviews and the PCA analysis show that the salient stressors in the community can be thought of as falling into four overlapping categories: economic stressors, substance abuse stressors, work and home life stressors, and health and medical care stressors. Within these four categories the most salient stressors are insufficient household funds, followed by a shortage of jobs in the community, and stress relating to child rearing. As illustrated above, a single stressor can be potentiated when intertwined with other stressors: it is not just the excessive drinking, but also the fact that her husband is spending money on alcohol when there are bills that cannot be paid; it is not just the illness, it is also the long trips to the hospital, having to take time off from work and finding transportation; it is not just
trouble with children, it is that there is not enough time, money or personal energy to provide the children with the types of food they want.

Finally, the results show that food insecurity is a multidimensional phenomenon that in Monteverde, is birthed out of the economic shift from agriculture to a mixed agro/tourism economy that occurred during the past two decades. These results show that economic uncertainty and job scarcity are the underlying factor behind the chief salient stressors in the community, including food insecurity, but that food insecurity presents its own stressors independently of these other factor that can compound other existing stressors.
Chapter 8: Discussion and Conclusion

Food insecurity is a condition affecting a growing number of people worldwide. The findings presented in this study support and build upon the growing corpus of research showing that food insecurity is a broad and complex social phenomenon (Coates, et al. 2006) that affects the nutritional and physical health (Stuff, et al. 2004; Townsend, et al. 2001) as well as the mental wellbeing of affected individuals worldwide (Coates, et al. 2007; Hadley and Patil 2006; Hadley and Patil 2008; Weaver and Hadley 2009; Whitaker, et al. 2006). The principal finding of this study, that stress experienced from an inability to afford the family’s food preferences can lead to symptoms of depression, stems from the combination of culturally salient stressors, ethnographic interviews, and the psychometric assessments, and support the pervious literature on this topic. The strength of this study lies in its use of culturally salient stressors to identify the specific stressors that are embodied to affect mental wellbeing, and the qualitative work that contextualizes the theoretical framework and study design.

The results from both the quantitative and qualitative portions of this study show an association between food insecurity and stress, depression, and anxiety, and extend anthropological studies on stress and food insecurity in a number of ways. First, the salient stress scale developed as part of this investigation provides an excellent measure of experience with culturally based stressors among Costa Ricans in Monteverde. The
use of this scale in conjunction with the HSCL-24 and the PSS provides a useful assessment of the impact these local stressors may have on the stress-related health. Additionally, because this scale was uniquely tailored for this population, it shows a strong level of internal reliability, and was sensitive to specific stressors associated with food purchasing patterns. This resulted in a scale that was robust to specific stressors in this community despite the small sample size. The use of this scale with the HSCL-24 and the PSS provided a method of cross cultural comparison as well as a means to examine how food-related stressors intersected with established mental health symptom dimensions. This combination of methods is useful as it elucidates which stressors might impact the mental well being of individuals in Monteverde.

The ANOVA results on the means of the items from the 30DSS show a statistically significant similarity among the stressors experienced in all three towns, with the exception of two, concern over drug use in the community and feeling overworked at their place of employment, which were both higher in Santa Elena. These findings suggest a similarity of experience regarding the types of stress experienced in the area, which is consistent with the qualitative data.

This study extends previous work on food insecurity and mental health in several ways. Ethnographic studies on this subject have exclusively utilized qualitative accounts of experiences with stress, depression, and anxiety as a result of food insecurity (Howard and Millard 1997; Scheper-Hughes 1992). Scheper-Hughes, in her seminal work *Death without Weeping: the violence of everyday life in Brazil* (Scheper-Hughes 1992) provides an exquisite ethnographic account of the relationship between poverty, hunger, and
mental wellbeing. She describes the hierarchy of poverty and hunger, as it is culturally defined:

“Poverty is defined by food scarcity and by dependency on medications. The poor are those who are always sick [...] and always hungry [...]. Food separates the self-respecting poor [...] from the miserable and the truly wretched. The self-respecting poor organize their lives around the constant struggle to feed themselves and their children, but they ‘get by’ and still have the strength to work. The truly wretched are those who must beg to eat and who are too sick or too weak to work.” (p.158).

Scheper-Hughes further describes how cultural views regarding eating as a private act, not unlike intercourse or defecation, and the symbolic meaning imbued to food, adds to the shame and humiliation for poor who already struggle to feed their family. She reports that foods in Brazil are imbued with rich symbolic meaning, where the amount and type of food one eats confers much about their social status. Consequently, the act of eating is surrounded by etiquette and performances designed to maintain one’s public image. For example, distinctions between *comidas*, (real foods, basic foods, foods satisfy) such as rice, beans and other starches and root vegetables commonly eaten by the poor, and *comidas luxo* (luxury foods, foods for the rich, foods that please the palate but tease the belly) commonly eaten by the rich, serve as dietary indicators for one’s social status. These indicators are so deeply entrenched in the culture that they govern eating customs for the rich. Eating *comidas luxo*, is surrounded in a performance custom for the rich. The rich appear publicly to only “nibble on teasing appetizers and frivolous luxury foods” (p.160), and never supposed to be seen eating *comidas*, yet mysteriously, they are never hungry. The poor in contrast, appear to eat the hardy *comidas* in large quantities, and yet they remain forever hungry. This custom is substantiated by a cultural belief that the poor must eat more than the rich because their biologically “inferior” constitutions
demand it (p.160). This is echoed in the ethnographic interviews conducted for this study in which the mother recalls feeling like she is failing in her motherly duties by feeding her children less prestigious cereal.

It is important to contextualize the food insecurity situation in Costa Rica with reference to this phenomenon on a global scale. The food insecurity situation in Costa Rica represents a relatively mild, yet no less valid, form of food insecurity when compared to the more extreme forms of food insecurity in Brazil (Scheperr-Hughes 1992) and in Tanzania (Howard and Miler 1997). In each of these cases, extreme hunger and malnutrition is much more prevalent, as are ethnographic accounts of its effects on mental wellbeing. However, I include them in this work to serve as an example of the consequences extreme food insecurity can have on the mental and nutritional health of a community if interventions are not made. Howard and Miller (1997) recount stories of anxiety and shame experienced by parents in rural Tanzania as they cope with vast seasonal variation in their food supply. They report the sense of moral failing that mothers feel who are unable to provide food for their children, and how malnourished children, too, are judged, for rejecting the responsibility to thrive and reciprocate affection to other family members. They also chronicle the villagers’ withdrawal of social support from severely malnourished children as they show signs of critically failing health, and how the children in turn withdraw out of a sense of shame. These studies have captured in vivid ethnographic detail the substantial psychological effects of extreme hunger and have laid the groundwork for current research the intersections of food insecurity and mental wellbeing. As the data from this study as well as the parent
study show, the situation in Costa Rica pales in comparison to these more extreme accounts and signal that the time is right to being intervening.

Recent anthropological research on food insecurity and mental wellbeing has combined ethnographic data and quantitative assessments of mental wellbeing. As Ice (2007) and Glaser, (Glaser and Kiecolt-Glaser 1994) have shown, standardized psychometric assessments provide a means for measuring the output of the stress process, (e.g., physiological responses, symptomatology, and behavioral responses), but lack the ability to detect input variables that trigger the response. As the stress response can be triggered by a wide range of responses to events, psychometric assessments need to be combined with other instruments designed to detect the specific input variables of interest (e.g. Food insecurity scales). Hadley and Patil (2006) have employed this technique combining ethnographic interviews, a modified version of the USDA’s food security model and the HSCL (also used in this study) to assess the relationship of mental wellbeing and food insecurity in a rural population of mothers in Tanzania. Their results show that food insecurity was positively correlated (P<.00001) with symptoms of anxiety and depression, but their research did not include assessments of causality. However, in a follow up study, (Hadley and Patil 2008), they did show using logistic regression that food insecurity was indeed a strong predictor of anxiety and depression (P<.000001), but made the argument that while their findings were significant, their conceptualizations of stress and food insecurity were not culturally based, and therefore should be regarded as proxies measures for the actual emic experiences of these phenomena. They suggest that incorporating saliency theory in order to establish culturally based conceptualizations of food insecurity and stress, anxiety and depression would offer more anthropologically
robust insights. This study incorporates Hadley and Patil’s suggestion by gathering qualitative information on salient stressors, local conceptualizations of stress, and salient experiences surrounding food insecurity.

The findings from the qualitative data show that the salient stressors in this area have an underlying theme related to economic insecurity. The recent decline in tourism-related revenues in the Monteverde Zone has taken a toll in the region’s economy. Businesses are forced to compensate by making layoffs and cutbacks, which leads to reductions in the household income, which in turn gives rise to anxiety a reduced capacity to pay the monthly bills and afford the family’s food preferences. Ethnographic interviews and observations suggest that the reduced amount of capital in the area is due both to a reduction in the number of tourists visiting the area, and a reduction in the amount of money that those who do come are spending. Interviews with restaurant owners, shop-keepers local artists and tour guides located in Santa Elena and Monteverde suggest that the tourism sector can be thought of as a two-tier system. The first tier can be thought of as the necessities for tourists: food, affordable lodging, necessary taxi services, and the major tourist attractions such as the biological reserve. The second tier can be thought of as luxury items such as the more expensive hotels and restaurants, locally produced art, and minor attractions like the reptile exhibit, nature walks, hanging bridge tours and adventure tours. In interviews, participants explained that they noticed tourists are coming for shorter amounts of time, staying in less expensive hotels, eating out less and in the less expensive restaurants, and taking less adventure tours (zip line attractions, off road 4x4 tours, etc.) and buying less locally produced art, and walking more and hiring taxies less. This suggests that in addition to a reduction in tourists’
dollars, the distribution of those dollars is making certain sectors of the tourist industry more vulnerable to economic uncertainty than others.

This economic shift is also affecting the traditional domestic roles in the area. Traditionally, men work to provide the primary source of income in the house while women work to take care of the home (Chant 2002). Interviews suggest that the male-dominated sectors tourism industry, such as taxi services, guided tours and the adventure tourism industry, are the most heavily affected by the decline in tourism revenues. However, many female interviewees have said that hotels in the area have recently begun hiring more women to meet the increased demand generated by the higher patron turnover rate. Women are being hired for cooking, cleaning and maid service positions. However, these jobs often require long hours and offer lower wages than what is needed to support a household, causing many women to look for additional jobs. The women describing these situations also said that in addition to taking up the role as the primary economic provider, they were still expected to fulfill their domestic roles in the home. Women reported that at the end of a long day at work, they returned home to households where they were expected to cook for their family, do the laundry, and help the children with their homework.

Ethnographic data also shows that another concern for parents is how this job scarcity means fewer jobs for working-age adolescents and young adults. The quote on page 119 illustrate how economic uncertainty and job scarcity give rise to a host of interconnected stressors. A reduction in the amount of tourists and tourist dollars in the area reduces the amount of employment options, which is affecting traditional domestic roles, and increases the strain on household budgets. While these data are not empirical
evidence of a link between economic uncertainty and these outcomes, these reports are consistent with other literature on the subject (Aneshensel 1986) and serve examples of how perceptions of a situation may trigger the stress response.

While food insecurity and poor mental wellbeing are associated with rapid economic transitions (Bronte-Tinkew, et al. 2007; Hadley and Patil 2008; Himmelgreen, et al. 2006; Laraia, et al. 2006; Leatherman and Goodman 2005; Lofton 2005), the research presented here suggests that food insecurity may introduce its own stressors independent of the political economic stressors. The results suggest that perceptions about food quality, variety, availability and one’s food purchasing power are just a few among many socially related pathways through which mental wellbeing is affected by food insecurity. This finding is consistent with a wealth of ethnographic data chronicling what Scheper-Hughes (1992) described as “delírio de fome — the madness of hunger” (p.128), and the shame, loss of dignity and stigmatization that Howard and Miller have shown accompany food insecurity in Tanzania. Indeed, the FAO recognized the biosocial and psychosocial nature of food security status when they amended the definition to include the notion of food preferences (FAO 2008). However, as Hadley (2008) and Weaver (2009) have argued, the mental health effects of food insecurity remain largely underrepresented in the literature. They suggest the possible reason is due to the fact that most measures of food insecurity focus on the nutritional and political economic aspects of food insecurity — which are substantial — but have only recently begun to examine the effects of food insecurity on mental health. As shown previously, the literature linking chronic stress, depression, and anxiety to noncommunicable diseases is substantial, and may present a compounding threat to diet related diseases. Therefore,
the full extent of food insecurity on the mental and physical health of a population remains largely unknown. This study presents a means for incorporating measures of food insecurity and mental health inventories to quantify the amount of variation in mental well being explained by food insecurity that can be used to suggest future research initiatives and inform public health interventions.

The findings from the spatial analysis showed that food insecurity was not randomly distributed throughout the region but rather was organized into clusters. Further, it was found that increased distance from the tourist hub of Santa Elena was a predictor of food insecurity. This is a useful finding as it gives insight into where pockets of food insecurity are located in the region, but also raises questions as to the social causes forming these clusters. Ethnographic data suggests that transportation through the mountainous and rugged terrain to the grocery stores in Santa Elena may be one factor for households further away from Santa Elena. This may especially be an issue during the rainy season when heavy rains may continue nearly nonstop for many days, even weeks, at a time. These rains wash away the top soil from the roads creating large potholes that create an unstable and slick surface on which to walk. As taxies are expensive in the area, and many homes are without personal transportation, this may be a form of tension when it comes to being able to transport enough groceries to feed a household. Additionally, the beginning of the rainy season typically signals the end of the tourist season, and for many, a decline in household income. This places further constraints on transportation options as less funds are available to allocate toward transportation costs. These results illustrate how geospatial data can be used in applied anthropological research to identify meaningful geographical patterns of social or
biological phenomenon that can aid in the development and deployment of community specific interventions.

Theoretical considerations

The qualitative and quantitative findings presented here support one another with regard to local conceptualizations of stress, anxiety and depression. These findings, when interpreted through the theoretical orientation of phenomenology and embodiment, offer insights into how food insecurity is embodied to produce an objectification from the ontological self. The theoretical interpretation of these findings is that food insecurity is phenomenologically experienced as a loss of control or an insurmountable problem that becomes embodied as depression overtime. The ethnographic reports presented here show that stress is locally conceptualized as a “feeling that comes when you can’t control [a] situation,” “when too much happens to you too fast and you can’t do anything to stop it” and having “problems you can’t solve.” Stress, if left unattended to, builds into depression, conceptualized as a “disease” which robs one of their ability to experience joy:

Further ethnographic explanations of how stress is experienced and embodied is consistent with phenomenological and embodiment constructions of the self. In the quote on pg 116, the participant articulates a monistic mind-body-spirit conceptualization (i.e., the mind, body and spirit as a unified whole, as contrasted to the cognitivist duality of the mind and body as separate entities) of the self and describes how depression progresses and affects each aspect of the whole. In this conceptualization she describes the spirit and the self as interrelated domains, with happiness being a transcendent property of
each. This suggests that the ability to experience joy is directly associated with a sense of being in touch with one’s identity as it is culturally and cosmologically defined. This articulation of the mind-body-spirit monism reflects the phenomenological position that our bodies are not objects to us, but a mimetic extension of our being (Csordas 2002). Further insight to this model is provided by the salient description of depression as a “disease” that causes “loosing the ability for joy”. Happiness and depression can be thought of in this model as in opposition to one another, and homologous to the self as a whole entity and the self as an objectified entity. Thus, if the happiness is the embodiment of the self, depression is the disembodiment of the self, or in the parlance of Csordas (2002), the objectification of mind from body.

The theoretical orientation of phenomenology and embodiment provides a context to interpret these findings. As the quote from Marx (see chapter 4) illustrated, Marx saw human beings as firmly entrenched in the natural world; and whose consciousness was dialectically related to objects in the external world. For Marx, the external world was comprised of both social and environmental dimensions that interrelate to create and fulfill the essential needs of individuals. Specifically he mentions hunger as a natural need for something of the outside world. Marx saw the creation of material items by an individual as imbued with and a reflection of their character and personality — an objectification of their internal identity into the external world. Conversely, food is an objectification of nature, and the act of eating a way of dialectically connecting with the external world. Therefore, food for Marx would be a mediator between the individual and nature, and as food is communally shared, also a mediator between the individual and society. The enjoyment one experiences from eating their preferred foods, ones that are
satiable, imbued with rich cultural meaning, that are aesthetically pleasing, nutritious and communally shared constitutes a means of exchange through which one’s true identity, both individual and communal, are confirmed and recognized. Thus, an interruption in this exchange process results in a disconnect between the individual and their true nature, the individual and others, and the individual and the natural world — a process Marx would later call *alienation* (Marx 1867/1992).

Correspondingly, Merleau-Ponty’s position that perception is central to consciousness provides a means to explain how such an interruption in the food supply is experienced and embodied. Perception plays a key role in the definition of food insecurity (see chapter 3), and in conceptualizations of stress, and it is through this perception that food insecurity most directly affects mental wellbeing. As the quantitative results have shown, not being able to afford the family food preferences is a salient stressor in the Monteverde Zone. This stressor was embodied as “feeling low in energy” and “feeling trapped or caught”, both symptoms of depression. In this model, food insecurity can be seen as an interruption in the dialectical relationship between an individual and nature and the individual and society that results in the alienation of one’s true self, or as stated earlier, the disembodiment of the self. In this way, when food insecurity is thought of as an phenomenologically embodied construct, food and the acts of buying food and preparing, exchanging, and consuming meals, become a culturally meaningful events that have nutritional, biological and psychological dimensions. These dimensions are dialectically intertwined and work in concert to affect our physical and mental wellbeing.
Suggestions for interventions

The findings from this study can be used to inform local level public health interventions. Food cooperatives that currently exist in the zone have been shown to increase the food security status of participant households (Himmelgreen, et al. 2006). The food co-ops provide an economical means of increasing the nutritional variety in the midst of rising food prices, while supporting local agribusiness (Himmelgreen, et al. 2006). It is possible that the food co-ops provide a means of social support for participating households whereby members engage in reciprocal exchanges. The role of co-op membership on mental wellbeing has not yet been explored, but numerous examples in the literature on mental health show that programs that foster community help mitigate the symptoms of acute depression and help participants cope with anxiety. Aspects of these programs could be incorporated into existing nutritional interventions, or could be offered as an extension. Additionally, group exercise has been shown repeatedly to have positive effects on both mental and physical health, and widely accepted as a preventative measure for overweight and obesity (Atlantis, et al. 2004; Carless and Douglas 2011; Deslandes, et al. 2009) and could likewise be incorporated into nutritional interventions.

In a randomized controlled trial study conducted in Australia, Atlantis and colleagues (2004) have shown how group activities involving light to moderate levels of physical activity, such a walking in groups, improved several quality of life measures in study participants. Participants (n=3,800) were given standardized tests to record general mental health, vitality, general health, bodily pain, physical functioning, depression and
stress, prior to beginning a 24-week group exercise program and behavior modification interventions. Behavior modifications included one-on-one nutritional education, goal setting education, and learning how to identify and remove mental barriers to physical exercise. Participants were randomly assigned to either the test group or the control group. The test group received both the exercise program and the behavior modification training, while the control group was told there were placed on a waiting list, but was still asked to comply with the study guidelines. The test group showed significant improvements in all of the measures in the study over of the control group. Additionally, the test group subjects saw significant improvements in BMI measurements; sleep quality, and self-reported energy levels. Public health initiatives that combine nutritional interventions with a focus on creating social support networks and group physical activity may provide a holistic, non-medicalized means of mitigating food insecurity and the associated mental and physical effects.

Conclusion

The findings in this study show that food insecurity predicts depression independently of other political economic factors that may be affecting mental health outcomes. Both qualitative and quantitative data show that there are a number of salient stressors in the area stemming from economic insecurity and job scarcity. Among them are concerns of one’s purchasing power related to the household’s food preferences, which was also shown to be a predictor for depression. These findings highlight the psychological impact of food insecurity are an acknowledged, but understudied aspect of this phenomenon.
The findings and methods used in this study also lend support for the notion that there is a one way connection between mental wellbeing and food insecurity. However, as Hadley and Patil (2006) point out, it very likely that the connection between food insecurity and mental well being is bi-directional. For example, Haddad (1999) has shown that there is a synergistic relationship between the underlying causes and the immediate causes of food insecurity that is mutually reinforcing: job scarcity and rising food prices may give way to household food insecurity, which may give way to malnutrition, making someone more susceptible to disease, making it harder to find work, which increases the food insecurity of the entire house (Haddad 1999). Extrapolating from this example and including the mental health symptoms found in this study to life in the Monteverde Zone, a similar cycle might be: job scarcity and rising food prices give way to household food insecurity, which gives way to depression and chronic stress, leading to lower levels of energy and a decreased sense of control over one’s life’s circumstances, making it harder to find work, which increases the food insecurity of the entire house.

This study is exploratory and cross sectional in nature. As such, it is limited in both size and scope with regard to seasonal variation in these phenomena, and presents an incomplete picture of food insecurity and mental wellbeing in the area. Future research on this subject should be longitudinal in nature in order to capture seasonal variation in both food security status and mental wellbeing, and should control for concomitant factors such as socioeconomic status, geographical space, and employment status.

This study will be archived in its entirety in the University of South Florida’s online electronic and thesis dissertation archives, as well the online archives at the Monteverde
Institute. This will allow future researchers and community members to access to future researchers and community members. These results will also be compiled and submitted for publication in a peer-reviewed journal.
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Appendices
Appendix A

30 Day Stress Scale

Code: ________________  Instructions: The following questions refer to experiences that may have happened in the past. Please circle the number next to the most appropriate answer.

Date: ________________
Interviewer: ___________

1) In the past 30 days, have you experienced stress because of not having enough money to pay your bills?
   1. No, not at all.
   2. Yes, but very little.
   3. Yes, a lot of the time.
   4. Yes, most of the time.
   5. Yes, all of the time.

2) In the past 30 days, have you felt stress because of illness in your family?
   1. No, not at all.
   2. Yes, but very little.
   3. Yes, a lot of the time.
   4. Yes, most of the time.
   5. Yes, all of the time.

3) In the past 30 days, have you felt stress because of a problem related to alcohol consumption in your community?
   1. No, not at all.
   2. Yes, but very little.
   3. Yes, a lot of the time.
   4. Yes, most of the time.
   5. Yes, all of the time.

4) In the past 30 days, have you felt stress because there has not been enough work?
   1. No, not at all.
   2. Yes, but very little.
   3. Yes, a lot of the time.
4. Yes, most of the time.
5. Yes, all of the time.

5) In the past 30 days, have you felt stressed because of problem related to drugs in your community?
   1. No, not at all.
   2. Yes, but very little.
   3. Yes, a lot of the time.
   4. Yes, most of the time.
   5. Yes, all of the time.

6) In the past 30 days, have you felt stressed because there has been too much work at your place of employment?
   1. No, not at all.
   2. Yes, but very little.
   3. Yes, a lot of the time.
   4. Yes, most of the time.
   5. Yes, all of the time.

7) In the past 30 days, have you felt stressed because you have not been able to recieve medical attention?
   1. No, not at all.
   2. Yes, but very little.
   3. Yes, a lot of the time.
   4. Yes, most of the time.
   5. Yes, all of the time.

8) In the past 30 days, have you felt stressed because of problems with your children?
   1. No, not at all.
   2. Yes, but very little.
   3. Yes, a lot of the time.
   4. Yes, most of the time.
   5. Yes, all of the time.

9) In the past 30 days, have you felt stressed because you have not been able to purchase enough of the foods your family likes?
   1. No, not at all.
2. Yes, but very little.
3. Yes, a lot of the time.
4. Yes, most of the time.
5. Yes, all of the time.

10) In the past 30 days, have you felt stressed because of domestic violence in your community?
    1. No, not at all.
    2. Yes, but very little.
    3. Yes, a lot of the time.
    4. Yes, most of the time.
    5. Yes, all of the time.

11) In the last 30 days, have you felt stressed because you have had to much work around the house and in your place of employment?
    1. No, not at all.
    2. Yes, but very little.
    3. Yes, a lot of the time.
    4. Yes, most of the time.
    5. Yes, all of the time.
Appendix B

David Himmelgreen, PhD
Department of Anthropology
Mailpoint: SOC107

RE: Approved Modification Request
IRB#: 106372
Title: The Impact of Economic Change on Food Habits and Nutritional Health in Monteverde, Costa Rica: Mixing Agriculture and Tourism

Dear David Himmelgreen, PhD:

On 05/26/2011 the Institutional Review Board (IRB) reviewed and APPROVED your Modification Request by Expeditable procedures. The submitted request has been approved from 05/26/2011 to 10/27/2011 for the following:

1. Change in key personnel: Addition of Robert Cowherd.

2. Revised procedures:
   A. Revised protocol to reflect addition of supplemental study to test the following hypotheses:
      - H1: Greater food insecurity will predict greater mental health issues;
      - H2: Both more perceived stress and stressors will predict greater mental health issues;
      - H3: Greater food insecurity will predict greater perceived stress, depression and anxiety.
   B. Household Food Insecurity Access Scale will be re-administered to participants.


Please note, if applicable, only use the IRB-Approved and stamped consent forms for participants to sign. The enclosed informed consent/assent documents are valid during the period indicated by the official, IRB-Approval stamp located on page one of the form. Make copies from the enclosed original.

Please reference the above IRB protocol number in all correspondence to the IRB or the Division of Research Compliance. It is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB.
About the Author

Robert Eugene Cowherd is a Florida native. He currently resides in Land O Lakes with his wife and two children and is pursuing his Ph.D. in Medical Anthropology.