

5-2010

## Impacts on maternal diet in a transitional community in rural Costa Rica: Potential implications for the developmental origins of obesity-related disorders

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<http://dx.doi.org/10.34917/2153776>

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IMPACTS ON MATERNAL DIET IN A TRANSITIONAL COMMUNITY IN RURAL  
COSTA RICA: POTENTIAL IMPLICATIONS FOR THE DEVELOPMENTAL  
ORIGINS OF OBESITY-RELATED DISORDERS

by

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Bachelor of Arts  
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A thesis submitted in partial fulfillment  
of the requirements for the

**Master of Arts in Anthropology  
Department of Anthropology  
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**Graduate College  
University of Nevada, Las Vegas  
May 2010**

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## ABSTRACT

### **Impacts on Maternal Diet in a Transitional Community in Rural Costa Rica: Potential Implications for the Developmental Origins of Obesity-Related Disorders**

by

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This thesis examines maternal diet in a rural, transitional community in Costa Rica. Using cross-cultural categories recognized in the ethnographic literature (i.e. dietary taboos, dietary prescriptions, food cravings and the acknowledgment of a special post-partum period diet), maternal dietary practices were identified in the local community through surveys (n=45) and participant-observation (n=5), and to reflect the actual consumption patterns of pregnant and nursing women in the area, 24-hour diet recalls were administered to 5 pregnant or nursing women. In light of the recent changes that increased tourism has brought to the Monteverde Zone, focus groups were employed to determine impacts on maternal diet. Results show that maternal diet has changed to include more “western” foods like French fries and Coca Cola. The majority of women in the sample admitted to being overweight during pregnancy and identified weight gain during pregnancy and the inability to lose weight post-parturition as two problems frequently experienced by women in the community. Results also revealed that although there is an overwhelming reliance on the local clinic for information about diet and nutrition during pregnancy and nursing (versus a more traditional source, such as family), women in the sample felt that they have not received beneficial information from this

source. Dietary delocalization and prevalence of overweight and obesity among women in the community have potential implications for the developmental origins of obesity-related disorders, and the miscommunication between the clinic and local community reveals that further research in this community is warranted.

## ACKNOWLEDGMENTS

I would like to acknowledge and thank my committee chair, Dr. Daniel Benyshek, for all of his support and understanding throughout my time at UNLV. Without his help, I would not be where I am today. I would also like to thank the other members of my committee, Dr. Heidi Swank, Dr. Deborah Martin and Dr. John Tuman. I would like to extend a special thanks to my additional committee member, Dr. David Himmelgreen at the University of South Florida, whose generous support in the field made this entire project possible. I could not have done it without you! I would also like to thank the Monteverde Institute in Monteverde, Costa Rica for welcoming me as a Research Affiliate and providing me with the resources I needed to complete this investigation. Another thanks is due to Ernesto Ruiz, who helped me in the field in a million ways, and for that he deserves a million thanks, I could not have gotten through my first field experiences without him. Thank you is also due to the Institute for Latin American Studies at UNLV for awarding me a generous travel grant that allowed me to complete this project. Thank you also to the Graduate and Professional Students Association at UNLV and the Anthropology Department for awarding me funding to carry out my investigation. Most of all I would like to thank the women who participated in this study, for without them, there would be no study. Their insight and help allowed me to understand what life is like for the women of Monteverde, if only for a few months.

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## CHAPTER 1

### INTRODUCTION

#### Purpose of the Study

The purpose of this preliminary study is to investigate maternal diet in a rural, mountain community in Costa Rica, which has recently been affected by a growing tourist industry. The Monteverde Zone in Costa Rica is located in the continental divide at an altitude of 1440 meters. This area is known for its biodiversity and is a popular tourist destination because of its cloud forest, home to thousands of species of insects, plants, mammals and birds (Hepworth 2008). The Monteverde Zone includes many smaller communities, with a total population of about 3,000 people (Amador 2004). The communities in which this study took place, Monteverde, Santa Elena and San Luis, were founded by American Quakers in the 1950's. The communities were built on the dairy industry, which is reflected by the presence of the cheese factory in the community as well as the availability of Monteverde dairy products throughout the country. Currently these communities are experiencing a shift from agricultural subsistence to an economy increasingly reliant on tourism.

In recent years, Costa Rica has increasingly appealed to the global community as an area of great biodiversity, and as a result, now attracts a large number of ecotourists annually. Ecotourism has become both common and popular in Costa Rica, and as local communities transition to meet the demands of the growing tourist economy, changes in community nutrition and health have become a concern (Himmelgreen et al. 2006). Recent studies have shown a high prevalence of female overweight and obesity in the Monteverde Zone (Himmelgreen et al. 2006; Ruiz 2009), indicating that maternal health

may also be a concern. Diet during pregnancy and nursing in transitional communities (e.g. the Monteverde Zone) is an important topic within the broader context of current public health concerns in Latin America today.

While maternal health improvements have been publicly advocated by many organizations, such as the World Health Organization (WHO) and the Pan American Health Organization (PAHO), there is a need to better understand the relationship between globalization and its effect on health over the lifecourse, particularly in regard to maternal diet during pregnancy and nursing. The global, biomedical community has fully recognized that diet and nutrition during pregnancy has immediate health impacts on both mother and fetus (WHO 2009). This knowledge has inspired initiatives to improve health care during pregnancy and the postpartum period, often focusing efforts on nutritional support (e.g. dietary supplements, commonly folic acid and iron). Recent research within the theoretical framework of the Developmental Origins of Health and Disease (DOHaD) has linked nutrition during pregnancy and nursing with increased risk for disease manifestation later in life, identifying environmental factors (e.g. diet) that can have potential impacts over the lifecourse. Risks for cardiometabolic diseases, such as type 2 diabetes and hypertension, are significantly affected by diet and nutrition during crucial developmental periods (i.e. gestation and nursing) (Barker 1995; Barker 2001; Gluckman and Hanson 2006). In Latin America (as in the rest of the world), chronic, non-communicable diseases are rising, and these recent epidemiological shifts, fully recognized within the last fifty years, have been associated with the rapid pace of development in the region (Frenk et al. 1996).

Chronic, non-communicable disease now accounts for 59% of the world's annual mortality rate (Dyer et al. 2006). Problems traditionally associated with aging are now affecting larger segments of the population. In Latin America, between 5% and 7% of children younger than 5 years of age, and 50%-60% of adults suffer from overweight and obesity (Dyer et al. 2006), a risk factor for many chronic diseases (i.e. hypertension, type 2 diabetes, CVD etc.). Diabetes has already affected thirty-five million people in the region (numbers that are predicted to rise) (Dyer et al. 2006), and cardiovascular diseases (CVD) are the leading cause of death and disability among both men and women (Pramparo et al. 2006). Although direct causes of these trends are varied (due to the large geographic area encompassed by Latin America), the epidemiological literature suggests that two strong contributing factors can be identified: 1) demographic aging (Lloyd-Sherlock 2000) and 2) rapid changes in diet and lifestyle, directly associated with development (Filozof et al. 2000; Uauy et al. 2001; Popkin 2001). Demographic aging, as defined by Lloyd-Sherlock, is "an increase in the percentage of a population 65 years or older" (2000:888) In Latin America and the Caribbean, the population 65 years of age or older increased from 3.5%-4.8% between 1950 and 1990 and these numbers are predicted to rise (Lloyd-Sherlock 2000). In Costa Rica, life expectancy at birth is 77.58 years (74.96 for men and 80.34 for women) (CIA 2010), comparable to some developed nations, including the United States.

Political, social and economic factors associated with globalization have also been shown to influence chronic disease rates by encouraging rapid changes in diet and lifestyle (Uauy et al. 2001; Popkin 2001; Popkin and Gordon-Larsen 2004). Diversity in the region as well as a lack of methodological standards have created a gap between

regional and local information regarding health trends, warranting further research within a local context (Frenk et al. 1996; Pramparo et al. 2006; Bautista et al. 2009). Tourism provides an avenue from which to explore these relationships within a local setting.

“Throughout Latin America and much of the developing world, nations are turning to tourism as a path of economic development for generating much needed foreign exchange” (Daltabuit and Leathermen 1998:317), and it is now clear that the growth of tourism in recent decades has undeniable biological, economic and social implications (Godde et al. 2000). This investigation will focus on the biological impacts of tourism (i.e. maternal diet), although all three categories (biological, economic and social) are inextricably linked. With the development of ecotourism in past decades, it is clear, as Godde et al. (2000) points out, that there is a growing awareness of the environmental impacts of tourism. With no exception, eco-tourism and sustainable tourism have become quite popular in Costa Rica, and since growing efforts to protect the environment in the 1970’s, 25% of Costa Rica is now protected land (Honey 1999). Although the government, as well as local communities, has endorsed this movement, little has been done to document the potential consequences for community health. The Monteverde Zone in Costa Rica sees 250,000 tourists annually and impacts are apparent. The community continues to transition to meet the needs of increased tourism, which includes a newly paved road and a chain supermarket, and problems of food insecurity and overweight/obesity among local residents are increasing (Himmelgreen et al. 2006). Previous studies found a high prevalence of overweight and obesity in women

(Himmelgreen et al. 2006; Ruiz unpublished), and indicate that maternal health may also be at risk.

“Maternal health refers to the health of women during pregnancy, childbirth and the postpartum period” (WHO 2009). Recent research in the Developmental Origins of Health and Disease (DOHaD) has found that maternal nutrition during gestation and nursing can have profound effects on the health of the growing infant (Hales and Barker 2001; Gluckman and Hanson 2006; Benyshek 2007; Yajnik 2009). Although some effects may not manifest immediately, they may become apparent much later in life when they contribute to significantly increased risk for cardio-metabolic disorders (e.g., metabolic syndrome, type 2 diabetes, hypertension) (Gluckman and Hanson 2006). These conditions have been shown to be heritable in recent animal models (Benyshek et al. 2006) and have the potential to affect the health of subsequent generations.

Some research suggests that focusing strategies on improved prenatal care, especially among high-risk populations, should be a top public health concern (Benyshek 2007; Benyshek 2005). While the biological experience of pregnancy and nursing is identical for all women (in terms of the general physiological processes involved), cross-cultural variation accounts for the array of dietary practices assigned to reproductive events by local communities (Brown 1976). Political-economic differences also influence the variation in birth outcomes experienced by women cross-culturally (Benyshek 2007). Not surprisingly, traditional dietary practices and behaviors during pregnancy/nursing are considered best for the welfare of mother and child by local community members (Barenness et al. 2009; Choudhry 1996; Driver 1961; Goodburn et al. 1995; Hartini et al. 2005; Obeyesekere 1963; Piperata 2008; Santos-Torres et al.

2003). This makes the detailed investigation of locally constituted knowledge regarding maternal nutrition during pregnancy and lactation essential, if community-based, DOHaD-oriented, public health interventions are to be successfully developed and implemented.

### Research Questions

In light of increased tourism in the Monteverde Zone and the importance of maternal health, this preliminary study aims to examine maternal diet in communities within the Monteverde Zone. The primary goals of the proposed investigation are to identify traditional, local dietary beliefs and practices during pregnancy/nursing; to learn about dietary beliefs and practices of pregnant and nursing women over the preceding three decades; and to examine how tourism may have affected traditional dietary practices during pregnancy/nursing in the Monteverde Zone, Costa Rica.

The main research questions for this investigation are:

- 1) What are local, traditional dietary beliefs and practices during pregnancy/nursing in the Monteverde Zone?
  - a. Can common pre/post natal dietary categories that are well represented in the cross-cultural literature (including: maternal food cravings, dietary taboos/restrictions, dietary prescriptions, and specified post-partum diets) be identified in the communities in the Monteverde Zone?
- 2) Are pregnant women adhering to locally accepted dietary behaviors during pregnancy/nursing in Monteverde Zone? Why or Why not?
- 3) Have traditional dietary beliefs and practices during pregnancy and nursing changed since tourism became popular in the Monteverde Zone?

## CHAPTER 2

### LITERATURE REVIEW

The world today is more accessible to its inhabitants than ever before in human history. The ability to move people, goods and ideas across borders has accelerated local development, encouraging participation in the global economy and impacting health through the delocalization of traditional diets. In many regions in the developing world, especially those high in biodiversity, ecotourism has become popular, facilitating changes in the local economy and reshaping daily lifestyles. In Latin America, there has been an increase in overweight, obesity and obesity-related disorders over the last twenty years and numbers continue to rise (Uauy 2001; Pokin 2001; Popkin and Gordon-Larson 2004). Past efforts to assess these problems within a local context have been fragmentary and, as a response to this, solution-oriented multi-disciplinary approaches to understanding overweight, obesity and obesity-related disorders are becoming more popular, commonly integrating public health strategies and anthropological perspectives. (Bensyshek 2005; Benyshek 2007; Chawla et al. 2004).

In Latin America these approaches are essential for understanding why specific segments of the population are more susceptible to overweight, obesity and obesity-related disorders than others, and to developing strategies to alleviate the consequences. Women have been identified as vulnerable members of the population and most studies indicate that, in Latin America, women have higher prevalence rates of overweight and obesity than men, making them more likely to develop related disorders (i.e. cardiovascular disease, type 2 diabetes and hypertension) (Filozof et al. 2001), some of

which are now the leading cause of premature death and disability in the region (PAHO 2009).

There is also strong evidence to suggest that the pre and post-natal environment play a significant role in the manifestation of overweight and obesity during the lifecourse of offspring (Gluckman and Hanson 2006). Recent research in the Developmental Origins of Health and Disease theory (DOHaD) has identified a link between maternal nutrition and offspring risk for overweight and obesity (Caballero 2006; Symonds and Gardner 2006). It has already been well established that pregnancy and nursing is a crucial developmental period for the fetus/newborn (WHO 2009), and therefore, researchers in both the health and social sciences alike have long studied maternal diet and nutrition as a way to understand maternal health and pregnancy outcomes. Maternal dietary behaviors are commonly cited in the cross-cultural literature and categorized into classifications that allow researchers to understand maternal health from within a specific cultural context, as well as compare practices cross-culturally. Common categories used are: food cravings, dietary prescriptions, dietary taboos, and the recognition of a post-partum period diet (Shostak 1983; Van Hollen 2003; Fittin 1993; Dube 1949; Chan 1976; Carrecedo 1993; Bora 2002; Sich 1981; Pool 1986; Moller 1958; Maloney et al. 1981; Pearn and Sweet 1977; Santos-Torres and Vásquez-Garibay 2003; Hilger 1936; Obeyesekere 1963; Goodburn et al. 1995; Choudry 1997; Hang 2002; Phillips 2005; Sahoo and Panda 2005).

This review will explore the current literature on overweight and obesity trends in Latin America, emphasizing the need to further explore women's health in regard to this disease risk factor. I will also discuss maternal overweight and obesity and the



associated health implications for both mother and child. The basic tenets of DOHaD will be outlined in an attempt to show how these ideas can be applied to public health initiatives, aimed at alleviating the burden of chronic disease. I will also review the ethnographic literature that draws attention to maternal diet. In addition, although little research has been done in the Monteverde Zone in Costa Rica, I will review recent evidence that suggests that members of the local community are experiencing food insecurity and that overweight and obesity in females is high, possibly related to recent, increased tourism in the region.

### Overweight and Obesity in Latin America

Over the last few decades, rates of overweight and obesity have risen globally, and today, 1.6 billion adults are overweight, and at least 400 million of them are classified as obese (WHO 2010). In the past, this burden has been referred to as a “disease of civilization,” and has mostly affected groups of higher social and economic status (Popkin 2004). Today, the tendency toward overweight and obesity is also occurring in developing nations, of both low and middle-income (Popkin 2004), and poses a problem in regions like Latin America, where obesity-related disorders (i.e. type 2 diabetes and cardiovascular disease) are the leading cause of death (PAHO 2009). According to the literatures, these adverse health outcomes can be attributed to two factors: 1) the theory of epidemiologic transition (Omran 1971) and 2) the nutrition transition (Popkin 1994). According to Omran, “the theory of epidemiologic transition focuses on the complex change in patterns of health and disease *and* on the interactions between these patterns and their demographic, economic and sociologic determinants and consequences” (1971:161). There are three stages of Omran’s epidemiologic

transition: 1) the age of pestilence and famine 2) the age of receding pandemic and 3) the age of degenerative man-made disease (Omran 1971). The second transition is marked by a shift in disease burden from infectious disease to man-made degenerative disease, (Omran 1971). Key features of this transition (i.e. the decrease in mortality, decrease in frequency of epidemics and increase in life expectancy) have been used to understand health outcomes already experienced in the developed world and are currently being experienced by the developing world. In Western nations (such as the United States and Great Britain) the Industrial Revolution that occurred around the turn of the 20<sup>th</sup> century was accompanied by economic, political and social changes that spurred an epidemiologic transition (Barrett et al. 1998). Improvements in social services and capital gain for many facilitated demographic aging and a decrease in mortality, and were major contributors to a marked transition in disease burden, from infectious, communicable diseases to chronic, non-communicable, degenerative diseases (Barrett et al. 1998). Latin America is experiencing similar health outcomes today as a result of rapid development occurring in its low and middle-income countries. Although Omran's concept of the epidemiologic transition has been criticized because of its use of a hierarchical model, as well as its use of the nation as the unit of analysis (Barrett et al. 1998), it is useful when trying to explore general, regional nutritional trends, such as those in Latin America today (Popkin 2002)

Accompanied by this shift is what Popkin (1994) has defined as the *nutrition transition*. Changes are characterized by the transition to a more “western” diet and lifestyle. This includes the consumption of higher saturated fats, and an increase in the consumption of simple sugars, refined foods and foods lower in fiber, coupled with

lower activity levels. These changes are often the result of rapid development and have contributed immensely to the increased prevalence of overweight and obesity in Latin America (Drewnowski and Popkin 1997; Popkin 2001). Although overweight and obesity have formerly been recognized as common health outcomes in affluent populations, characterized by high socio-economic status, there is now an inverse relationship between socioeconomic status and chronic disease rates (Popkin 1994). In Latin America, where social services for the poor are often lacking, the rise in overweight and obesity for large segments of the population is without recourse, increasing the risk for obesity-related disorders.

Latin America encompasses a large geographic region that includes Mexico, some islands in the Caribbean (Dominican Republic, Cuba), Central America (excluding Belize) and most of South America (excluding Suriname and Guyana) (Chackiel and Plaut 1996). Connected (in most cases, with the exception of Brazil) by a common language, Spanish, this culturally diverse area is experiencing similar patterns of rapid economic development and resulting in a high prevalence of overweight individuals (Filozof et al. 2001). Studies indicate that prevalence rates of overweight and obesity are much higher in women and children and that pre-obesity prevalence is high within the national populations (Filozof et al. 2001; Martorell et al. 1998). Unfortunately, due to a lack of methodological consistency and uniformity, as well as highly variable between-country social, political and economic factors, no data exist which address the issue of overweight and obesity within the region as a whole. There is, however, within-country data that draws out these issues within a local context. As a direct response to this issue, the Latin American Consortium of Studies in Obesity (LASO) has been developed to

acknowledge and alleviate the problems fragmentary data has caused in understanding the causes and consequences of overweight and obesity in a heterogeneous region (Bautista et al. 2009). Consisting of Latin American collaborators (both academic and research oriented), LASO's goals are four-fold:

“(i) To accurately estimate the prevalence of obesity and its distribution by sociodemographic characteristics in Latin America; (ii) To identify ethnic, socioeconomic and behavioral factors (nutritional and physical activity patterns) associated to the prevalence of obesity; (iii) To estimate the association between various anthropometric indicators of obesity and classic cardiovascular risk factors and (iv) To quantify the validity of standard definitions of obesity in this population.” [Bautista et al. 2009:3]

Addressing many of the shortcomings of past research on overweight and obesity in the region, this group draws on national data sets and aims to promote increased collaboration between researchers in Latin America (Bautista et al. 2009). Until this project is developed more fully, we must rely on country-specific data to understand trends at a state level.

Costa Rica is experiencing the same region-wide health outcomes of increased overweight and obesity linked with rapidly changing social and economic conditions. In Costa Rica, reasons for this shift are twofold. First, extreme healthcare reform in the 1970's resulted in free healthcare services for the entire country, and second, the country has been explicitly linked to the global market since the end of the 19<sup>th</sup> century, by opening its doors to development (Molina and Palmer 2007). More biomedically advanced and widely available healthcare services have helped to decrease mortality and

increase life expectancy, while increased involvement in global market activities such as tourism, have resulted in the increased popularity of a “western” diet and lifestyle, resulting in a *nutrition transition*. Nation-wide health data from the *Ministerio de Salud* (Ministry of Health) indicate that overweight and obesity have increased dramatically since the improvement of basic health services in the 1970’s. Overweight and obesity (defined here as BMI greater than or equal to 30) in women of childbearing age (20-44 years) has almost doubled since 1982 (Agüero 2009). In areas that have seen a marked increase in tourism in recent years, there is also a high prevalence of overweight and obesity. A study carried out in two communities in the Monteverde Zone (Santa Elena and San Rafael), Costa Rica, revealed that 37% of study participants were overweight (defined here as a BMI between 25 and 29.99) and an additional 30% of them were obese (defined as  $BMI \geq 30$ ) (Himmelgreen et al. 1996). Since all study participants were women, implications for women and children’s health should be addressed through further research. A more recent study on food security in Monteverde Zone revealed that women in the study ( $n= 180$ , average age 42) had an average BMI of 27 (Ruiz et al. 2009), indicating ‘overweight’ status by WHO criteria (2010), and a severe health risk among women in the community. This is problematic for the women of living in these communities, not only because of the increased risk for diseases associated with being overweight, but also because of the impact this can have on offspring.

Additionally, in Latin America (as in other parts of the world) there has been an increase in the coexistence of undernourished (underweight or stunted) and overnourished (overweight or obese) individuals living in the same household, and referred to as dual burden households, resulting from what is referenced as the nutrition

transition paradox (Doak et al. 2005). Similar trends have been identified in Brazil, Russia, China, Vietnam, Indonesia, Kyrgyz Republic and the U.S. (Doak et al. 2000; Doak et al. 2005). Research suggests that the mechanisms behind this phenomenon in transitional communities are either: 1) individual differences in experiencing the nutrition transition, or 2) dietary quality (Dietz 1995; Garrett and Ruel 2003). The latter provides a good explanation for the presence of stunted children and overweight mothers in the same households. Poor dietary quality can lead to poor development and stunting in children, while deficiencies in adults can lead to overweight and obesity when they are consuming high-energy, calorie dense foods (Garrett and Ruel 2003). Dual burden households have also been linked to Gross National Product (GNP), with countries in the middle range GNP, such as Costa Rica, having the largest number of dual burden households (Doak et al. 2005).

Furthermore, current research suggests that food insecurity is linked with overweight and obesity, and many studies have focused on the high prevalence in women (Townsend et al. 2001; Adams et al. 2003; Tanumihardjo et al. 2007). Although seemingly paradoxical, the relationship between food insecurity and overweight/obesity has been clearly identified and specific physiological mechanisms have been suggested. When this relationship first gained recognition in the U.S., Dietz (1995) suggested that periods of insufficient foods created an adaptive response in the individual, causing them to store fat more efficiently when possible. This is also the underlying mechanism that explains the dangers of weight gain as a result of skipping meals. Dietz (1995) also suggested that food choices, or consuming foods higher in fat content to prevent hunger, may contribute to this health risk as well. Studies have shown that humans prefer foods

items high in sugar and fat (Drewnowski and Spector 2004), further supporting this hypothesis.

### Maternal Overweight and Obesity

Maternal overweight and obesity refers to women's weight during pregnancy and nursing, as well as a pregravid (prior to conception) body mass index (BMI) of greater than 25 (Nohr et al. 2008). BMI is used to define weight status in adults as underweight (BMI <18.5), normal (BMI 18.5-24.99), overweight (BMI  $\geq$  25) or obese (BMI  $\geq$  30); and is calculated dividing weight in kilograms by height in meters squared (WHO 2010). Although it is common knowledge that a woman's health during pregnancy and nursing affects the health of her unborn child, we are now just beginning to understand this complex relationship, and with global overweight and obesity on the rise, particularly in women, it is important to turn attention to the consequences of this chronic disorder and how it impacts maternal and offspring health. As mentioned above, overweight and obesity are risk factors for many disorders, but women have additional risks, such as menstrual and fertility problems and increased risks during pregnancy (Lake et al. 1997).

Studies have shown that high pregravid BMI and pregnancy weight gain can have severe impacts on maternal and child health, both during gestation and intergenerationally (Oken et al. 2008; Siega-Riz et al. 2004; Cnattingius et al. 1998; Emanuel 1986; Siega-Riz and Laraia 2006). Excessive pregnancy weight gain in normal weight individuals has been shown to increase post-pregnancy weight retention in women (Nohr et al. 2008), increasing risk for overweight. Also, women who develop gestational diabetes have between a 17 percent and 36 percent risk of developing type 2 diabetes within 5 to 16 years (Smith-Morris 2005). Some potentially life-threatening

consequences of maternal overweight and obesity during pregnancy are gestational diabetes, pre-eclampsia, c-section, birth defects, fetal macrosomia (birthweight of 4000-4500 g) and perinatal mortality (Siega-Riz 2006; Cnattingius et al. 1998). Both gestational diabetes and fetal macrosomia increase the risk for overweight or obesity in offspring, which has been linked to the mother's high pregravid BMI (Oken 2008). If the offspring are female, this increases the risk that overweight and obesity will affect her future generations, perpetuating the cycle. Along with the biological fetal programming of overweight and obesity in offspring, social behaviors are also often transmitted intergenerationally, potentially encouraging unhealthy dietary behaviors passed on from the overweight/obese mother (Cutting et al. 1999).

#### The Developmental Origins of Health and Disease Theory

The Developmental Origins of Health and Disease (DOHaD) theory examines the link between the pre and post-natal environment and chronic disease risk during the lifecourse of offspring. "The fundamental assumption underlying the DOHaD model is that environmental factors acting in early life have consequences which become manifest as an altered disease risk in later life" (Gluckman and Hanson 2006). DOHaD researchers have suggested that increased risk in adult life for conditions such as overweight/obesity, metabolic disorders, cardiovascular diseases, osteoporosis, cognitive decline, behavioral abnormalities and some cancers is strongly associated with perturbations (e.g., poor nutrition) in the pre and early post-natal environment followed by adequate or excess nutrition in childhood and adulthood (Gluckman and Hanson 2006; Barker 1995, 1997; Hales and Barker 1992; Susser and Lin 1992; Ravelli et al. 1998;1999; Roseboom et al. 2001; Yajnik 2004; St. Clair et al. 2005; Caballero 2006).



The poor prenatal nutrition followed by adequate or excess in adulthood characterizes the metabolic/CVD disorders, but not some of the other disorders associated with developmental etiologies (e.g., cognitive disorders, behavioral abnormalities, etc).

Although DOHaD as a discipline is a relatively new field, the ideas underlying its development over the last twenty years are not. In 1962 James Neel published a paper on the genetic origins of diabetes and insulin resistance, labeling his idea as the “Thrifty Genotype Hypothesis”. Neel (1962) proposed that insulin resistance might have been advantageous for our hunting and gathering ancestors that often experienced conditions of famine, allowing them to store and use energy more efficiently. According to Neel, the continuous availability of food today and increased longevity of life has caused this adaptive genetic disposition to result in disease (diabetes). Although the main assumptions of Neel’s theory, that the origins of type 2 diabetes is purely genetic and that hunting gathering communities frequently experience periods of famine, have been successfully contended since it first appeared in print (Hales and Barker 1992; Gluckman and Hanson 2006; Benyshek and Watson 2006; Bouchard 2007; Paradies et al. 2007), the recognition of a genetic component associated with chronic disease risk encouraged further exploration into the etiology of chronic diseases that were becoming more prevalent.

As an alternative to the genetic explanation presented by Neel, Hales and Barker developed the “Thrifty Phenotype Hypothesis” (1992), based on the principle tenets of life history theory. Throughout an organism’s life, the efficient allocation of resources is necessary for both survival and reproduction. Life history theory acknowledges that certain trade-offs (with respect to competing demands on the organism for growth,

reproduction, and body maintenance) must occur in order to ensure survival and reproduction alike (Hill 1993). Hales and Barker used this idea to explain previous correlations observed by Barker. In the 1980's, Barker and colleagues made numerous observations that linked birth weight to increased disease risk for ischaemic heart disease in adult life (Barker and Osmond 1986). Hales and Barker suggested that the low birth weights were the result of slowed fetal growth, which allowed for survival of the fetus in a less than optimal prenatal environment. This developmental trade-off has immediate benefits, in that it ensures survival into neonatal life, but has long-term negative consequences in the form of disease manifestation in adult life. This is a result of the neonate going from an environment of undernutrition to one of adequate nutrition or of excess outside of the womb. From an evolutionary perspective, this type of trade-off would have helped our ancestors to survive (at least until reproductive age) under suboptimal conditions, but in a modern context, with the long length of the human lifespan today, this developmental trajectory results in disease.

Further investigation into the mechanisms responsible for the associations observed by Barker led to the development of the “Barker hypothesis”, well known today as the “fetal origins hypothesis”. “The fetal origins hypothesis states that fetal undernutrition in middle to late gestation, which leads to disproportionate fetal growth, programmes later coronary heart disease” (Barker 1995: 171). Records from Hertfordshire, England indicate that in a sample of 16,000 people born between 1911 and 1930, death from coronary heart disease was increased 2-fold with those at the lower and upper ends of the birth weight distribution (Osmond et al. 1993). In the United States the Nurses’ Health Study found a similar trend in a sample of 80,000 women

(Rich-Edwards J 1995), and in India coronary heart disease was linked with low birth weight as well (Stein et al. 1996). Other studies in Sweden, the U.S. and the U.K. confirmed the findings (Barker 1995; Valdez et al. 1994; Lithell et al. 1996). Barker drew on existing ideas within biology to support his own observations. During gestation, the fetus' tissues develop in different stages, identified as "critical" periods of growth (referred to today as "critical windows") (Widdowson and McCance 1975). Once each respective period has passed, the resulting physiology is set for life, programming the structure and function of the tissue (Widdowson and McCance 1975). Barker argued that fetal undernutrition would later result in a pathological manifestation if diet improved later on, and has demonstrated this association in later work done on the Dutch Hunger Winter. In the winter of 1944/1945 the people of Netherlands experienced a severe famine, and as a result of meticulous record keeping by the Dutch, researchers were able to identify the effects of prenatal exposure to a severely restricted diet on adult health. Researchers found that exposure to famine at different stages of gestation produced different effects in adult life, including obesity, glucose tolerance and coronary heart disease (Ravelli et al. 1998; Ravelli et al. 1999; Roseboom et al. 2001), providing strong empirical support for Barker's hypothesis. Animal models also supported the hypothesis and show that fetal undernutrition could lead to changes in blood pressure, cholesterol, metabolism, insulin responses to blood glucose and disruptions in other metabolic, endocrine and immune functions (Barker 1995; Desai et al. 1995; Langley et al. 1995).

From this hypothesis, the "fetal origins of adult disease" (FOAD) was developed and the name was later changed to the "Developmental Origins of Health and Disease".

The reasons for this change were twofold. First, “the early life events which determine in part the risk of later disease occur not only in the fetal period specifically, but throughout the plastic phase of development,” (Gluckman and Hanson 2006) which includes infancy. Secondly, the “terminology emphasizes that this area of science has implications not only for disease, and its prevention, but also for health promotion” (Gluckman and Hanson 2006).

As DOHaD theory and practice developed under its current model, older ideas previously thought to be prominent to the discipline were challenged and revised. We now know that birth weight is not a precise measure of developmental disruption or altered disease risk in adult life (Roseboom et al. 2001). Records from the Dutch Hunger Winter indicate “maternal malnutrition during gestation may permanently affect adult health without affecting the size of the baby at birth,” and that timing and type of malnutrition have differential effects on adult disease risk (Roseboom et al. 2001). Macrosomia (excessive birth weight between 4000-5000g) has also been shown to be an indicator of increased risk for overweight/obesity and type 2 diabetes in later life, indicating that there may be a u-shaped curve associated with weight and chronic disease risk (Pettitt and Jovanovic 2001). Most importantly, these associations are now recognized as complex, with many components that can influence the outcome of each pathway. For example, studies have shown that of babies born with low birth weight, those that experience rapid “catch-up” growth in early childhood are most at risk for overweight/obesity, coronary heart disease, type 2 diabetes and hypertension, emphasizing the importance of growth during infancy in determining disease risk (Eriksson et al. 1999; Stettler et al. 2003; Bhargava et al. 2004).

Recognizing the complexity of these issues has expanded the scope of DOHaD to include researching specific mechanisms responsible for health outcomes. New advances in the fields of biology and genetics have allowed researchers to better understand gene-environment interactions. The field of epigenetics has been developed and helps to explain how environmental factors affect gene expression. First coined by Waddington (1942), the term epigenetics today implies a pathway that links the genotype with phenotypic expression. It is quite clear from the evidence presented by Barker and others that the prenatal environment has a pronounced effect on the phenotype of the individual, and although inheritance of disease phenotypes has been recognized in the past, it has not been until recently that researchers accept that non-genomic inheritance (i.e. epigenetic inheritance) is responsible, in part, for the dramatic increase in recent years of overweight/obesity, type 2 diabetes and cardiovascular disease.

Specialized cells in the body (i.e. liver cells, skin cells, kidney cells etc.) maintain different structures and functions, although they carry the same genetic information. “The differences between specialized cells are “epigenetic” and are “the consequences of events that occurred during the developmental history of each type of cell and determined which genes are turned on, and how their products act and interact” (Jablonka and Lamb 2006). Epigenetic pathways are informed by environmental cues. This includes fluctuations in resources or environmental preferences as the result of cultural or social inheritance systems (Jablonka and Lamb 2006; Gluckman et al. 2007). These epigenetic signals can be passed on to progeny through mitosis, and when an inappropriate signal is received (causing expression or silencing of one or more genes) the result is the heritable, disease phenotype (Whitelaw and Garrick 2006). Animal

studies have supported these claims by showing that disease phenotypes can be expressed intergenerationally (Drake et al. 2005; Martin et al. 2006; Harrison and Evans 2009; Benyshek 2006), reflecting the same processes currently occurring in humans.

Although DOHaD is based on an understanding of the biological processes underlying disease etiology, a key feature today is the potential to influence intervention and prevention strategies in a clinical setting. As outlined above, DOHaD clearly establishes that there is a strong environmental component associated with the etiology of many chronic diseases, making prevention/intervention models ideal for public health initiatives aimed at alleviating overweight/obesity and related disorders. As previously mentioned, there is a u-shaped birthweight curve that identifies greater risk for obesity in both low birthweight and macrosomic neonates, creating a similar outcome from two extreme developmental pathways. Increased prenatal care, with an emphasis on maternal diet and appropriate weight gain during pregnancy has strong potential to influence metabolic outcomes in offspring. In regions such as Latin America, where a double-disease burden exists, employing strategies that encourage healthy behaviors in women, before and during gestation, will have positive impacts on the metabolic health of offspring, as well as providing potential to pass on these behaviors to progeny. Giving women the tools to help them achieve control over their health and the health of their children can also be viewed as a form of empowerment. Although some have argued that “targeting” women for prevention and intervention programs creates a formal arena from which to “blame” women for adverse health outcomes (Noble 2006), others support these initiatives and their potential to alleviate disease burden in a non-invasive, practical way (Manson 2001; Greer 2002; Benyshek 2005).

### Maternal Diet

Dietary practices during pregnancy and nursing affect the growth and development of the fetus, as well as impact maternal health. Although the innumerable pregnancy and health outcomes of poor maternal nutrition are beyond the scope of this paper, as previously mentioned, inadequate or excess nutrition can lead to a predisposition for overweight and obesity throughout the lifecourse of offspring. The most accessible way to measure maternal nutrition is to study maternal diet. Although other factors contribute to maternal nutrition (i.e. a mother's nutritional stores, disease history and current pathological conditions), studying maternal diet has allowed researchers to understand maternal health and nutrition from a culturally specific context, as well as cross-culturally.

Maternal diet, and dietary practices in general, can be understood from both a cultural idealist approach, as well as a materialist perspective (Harris and Ross 1987). "Cultural idealists explain variations in food preferences and aversions as a consequence of 'culture' (by which they mean the learned emic and mental components of social life)" (Harris and Ross 1987). Well-known anthropologists like Claude Lévi-Strauss and Mary Douglas have used this approach within a structuralist framework to explain dietary preferences and aversions, such as the Judaic swine taboo (Harris and Ross 1987). "Cultural materialist strategies are based on the assumption that biopsychological, environmental, demographic, technological, and political-economic factors exert a powerful influence on the foods that can be produced and consumed by any given human population" (Harris and Ross 1987). Marvin Harris and Eric Ross were strong proponents for this approach, using it to refute many idealist explanations, such as

Lowie's East African cattle complex, and claiming that the nomothetic basis was scientifically superior to idealist perspectives.

The integration of both approaches (i.e. eclectic approaches) is common today, and when studying maternal diet, many researchers identify culturally appropriate behaviors, as well as situate those practices in time and place, assessing maternal health in context. Anthropologists use specific dietary categories to refer to pregnancy behaviors; taboos, prescriptions, cravings and the recognition of a distinctive postpartum diet are commonly used in the classic, cross-cultural ethnographic literature to describe pregnancy practices (Shostak 1983; Van Hollen 2003; Fittin 1993; Dube 1949; Chan 1976; Carrecedo 1993; Bora 2002; Sich 1981; Pool 1986; Moller 1958; Maloney et al. 1981; Pearn and Sweet 1977; Santos-Torres and Vásquez-Garibay 2003; Hilger 1936; Obeyesekere 1963; Goodburn et al. 1995; Choudry 1997; Hang 2002; Phillips 2005; Sahoo and Panda 2005). Researchers also use this framework to assess nutrition in current time and place (Fitzgerald et al. 1992; Bareness et al. 200; Nichter and Nichter 1983; Hartini et al. 2005; Dufour et al. 1999; Piperata 2008). Nichter and Nichter (1983) used "conceptual analysis of dietary ideology during pregnancy to complement socioeconomic analysis of income investment and nutritional analysis of nutrient intakes and absorption" in India. More recently, Barbara Ann Piperata (2008) used a biocultural perspective, recording cultural practice as well as quantifying dietary intake and energy expenditure, to understand postpartum practices in the Amazon. She found that women were far from maintaining energy balance during this time, a direct result of cultural practice. Hartini et al. (2005) gathered data on pregnancy practices and dietary intakes in Indonesia during the economic crisis in 1997, and found that women adhered to some



traditional practices even though they were costly during this financially difficult time. These examples reflect the successful use of eclectic perspectives in understanding maternal nutrition from within a current, cultural context. In many cases work from within this framework can be applied to practical problems, aiding in the development of public health initiatives aimed at improving maternal health and nutrition status.

## CHAPTER 3

### METHODOLOGY

For this preliminary investigation I have applied a biocultural perspective, drawing from ethnographic literature about maternal dietary practices as well as the Developmental Origins of Health and Disease theory (DOHaD). The biocultural approach within medical anthropology synthesizes biological and cultural anthropology in an effort to successfully examine relationships between human biology and culture (Goodman and Leatherman 1998). Since my research aims to provide a holistic account of maternal dietary practices in the Monteverde Zone, Costa Rica, my methods have been triangulated, engaging both quantitative and qualitative components. During my ten week stay in the Monteverde Zone I conducted 45 surveys with community members, carried out two focus groups with local mothers, conducted six 24-hour diet recalls and continually participated in and observed daily life through participant-observation, both formally and informally.

#### Field Site

Cost Rica is located in Central America between Nicaragua to the north and Panama to the south, and is considered a middle-income country (WHO 2010). The government offers social services to all citizens, providing clean water to most of the country and free healthcare to all. After healthcare reform in the 1970's the Costa Rican *Ministerio de Salud* (ministry of health) now offers free healthcare, which includes all services and medications (Molina and Palmer 2007), and a monthly pre-natal examine required by the state for all women. Costa Rica's economy is dependent on industry, agriculture and tourism and services (CIA 2009). Tourism and services now make up

68% of the gross domestic product and ecotourism has become extremely popular. Costa Rica has approximately 5% of the world's biodiversity in .035% of the world's surface (Honey 1999).

The field site for this investigation is located in the Monteverde Zone, in the continental divide. This region has become a popular tourist destination within the last 15-20 years (Himmelgreen et al. 2006) due to the biodiversity in the region. This area is comprised of many small communities with a total of about 3,000 permanent residents. Annually, 250,000 tourists visit the region (Himmelgreen et al. 2006) and it is apparent that this large number of visitors has had an impact on local communities. In 2006, Himmelgreen et al. found that the flux in the tourist season may be related to food insecurity because the local economies are increasingly reliant on the tourist industry for subsistence. Participants for my investigation were from the communities of San Luis, Cerro Plano, Santa Elena and Cañitas in the Monteverde Zone.

### Qualitative Methods

Semi-structured and structured interview techniques, as well as participant-observation were used to collect data for this investigation. Due to the nature of the research questions, with the strong component of gathering cultural knowledge, ethnographic methods were best suited for this study.

The qualitative approach to data collection, typically defined as non-numeric (Kirk and Miller 1986) or “any type of research that produces findings not arrived at by statistical procedures or other means of quantification” (Strauss and Corbin 1990:10-11), has been a hallmark of anthropological research since its inception as a discipline. “It can refer to research about persons’ lives, lived experiences, behaviors, emotions, and

feelings as well as about organizational functioning, social movements, cultural phenomena and interactions between nations” (Strauss and Corbin 1990:11).

Although ethnography involves both qualitative and quantitative approaches for data collection, the former is emphasized here. Ethnography “sets out to show how social action in one world makes sense from the point of view of another” (Agar 1986:12). This type of research is conducted in ‘natural settings’ and the researcher actually observes the everyday life of individuals. Although this method has gained popularity in many disciplines, it remains core to anthropological research.

#### Semi-structured Interviews: Focus Groups

Semi-structured interviews involve the use of an interview guide, “a written list of questions and topics that need to be covered in a particular order” (Bernard 2006), but allow both the researcher and the participant to follow new avenues during the interview. Focus groups are conducted in this manner and “are recruited to discuss a particular topic” (Bernard 2006). When triangulated with other methods, such as surveys, focus groups can be an effective research tool (Bernard 2006).

During this investigation two separate focus groups were carried out in order to address two major goals of this project. First, I aimed to understand local, traditional dietary beliefs and practices during pregnancy and nursing in the Monteverde Zone, using cross-cultural dietary categories (taboos, prescriptions, cravings and specified post-partum diet) well represented in the ethnographic literature. Secondly, I wanted to understand how traditional dietary beliefs and practices have been impacted since tourism became popular in the Monteverde Zone, as well as explore potential health implications.

Both focus groups were mediated by a local *tica* (Costa Rican woman) whose primary language is Spanish. I chose a mediator who is both a native speaker and a local woman so that my participants would feel more comfortable sharing their experiences with pregnancy and nursing. Although I was not the mediator for the focus groups, I was present to introduce myself and take notes. Both focus groups were recorded with an audio recorder. The mediator used a list of questions that I designed (see appendix 1) in order to elicit information about traditional diet during pregnancy and nursing, and engaged both groups in a free listing activity. Participants were encouraged to list items that were relevant to the assigned topic (e.g. what foods are commonly consumed during pregnancy?). The purpose of conducting two separate focus groups was to identify impacts on maternal diet over time, as related to increased popularity of tourism in the area. Specific criteria were assigned for participation in each group to ensure that I had mothers who were pregnant both, before and after tourism became popular.

For comparative purposes, group one was composed of 5 local, *tica* mothers with children younger than ten years of age. This group was pregnant after tourism became popular in the Monteverde Zone. Group two was composed of 6 local, *tica* mothers with children between the ages of twenty and thirty years. This group was pregnant before tourism became popular in the Monteverde Zone, providing a way to compare experiences over time. Both groups were held at the Monteverde Institute in Monteverde, Costa Rica and transportation was provided to encourage participation.

Although studies testing the validity of dietary remote recalls suggest that recall is weak (Friendenreich 1994), there have been few studies on the accuracy of recalls of diet during past pregnancies (Bunin et al. 2001). One study (Bunin et al. 2001) found

that accuracy was similar or slightly lower than regular adult diet recalls. However, Bunin et al. (2001) recognized the influence of current, non-pregnancy diet on recalls, and within this community, many food items that are consumed during pregnancy are consumed on a regular basis. Therefore, I believe that for the purposes of this investigation remote recall is an appropriate method to employ.

#### Structured Interviews: Surveys

During structured interviews “each informant or respondent is exposed to the same stimuli...the idea in structured interviewing is always the same: to control the input that triggers people’s responses so that their output can be reliably compared” (Bernard 2006). This method allowed me to compare survey responses in a systematic way, as well as identify relevant themes in the data. In order to address my goal of identifying traditional beliefs about dietary practices during pregnancy and nursing, I administered surveys to 45 individuals from the Monteverde Zone. I only allowed adult, local (living in the Monteverde Zone) *ticos* to participate. I designed the survey to gather some demographic information, as well as specific information about the cross-cultural dietary categories previously mentioned (see Appendix 1), and I surveyed both men and women from the local community to get a comprehensive view of accepted dietary practices. This exercise provided me with information about local knowledge regarding these issues, allowing me to revisit relevant themes with community members during informal conversations and participant observation. This exercise also provided me with the opportunity to interact with members of the local community and build rapport with a variety of individuals.

### Participant-observation

Participant-observation “is a method in which a researcher takes part in the daily activities, rituals, interactions, and events of a group of people as one of the means of learning the explicit and tacit aspects of their life routines and their culture” (Dewalt and Dewalt 2002). This method, “accepted almost universally as the central and defining method of research in cultural anthropology” (Dewalt and Dewalt 2002), allows the researcher to take both an “emic” and “etic” perspective. The “emic,” or “insiders” view, gives the researcher a working knowledge of the group under study from the inside, out, allowing a more in-depth understanding of the conditions and the environment under study. Combined with the “etic,” or “outsiders” perspective, provides the researcher a unique position from which to understand and analyze data.

For this investigation I used participant-observation to actively participate in and observe the daily lives of both my study participants and the communities of Monteverde, Santa Elena, San Luis, Cerro Plano and Cañitas. Formally, I recruited 5 women to engage with in participant-observation. I worked with three pregnant women and two nursing women with young children. I spent two non-consecutive days with each participant, observing and participating in their daily lives. I visited each woman at her house and each visit lasted from 5-10 hours, depending on the time parameters set by each woman. This exercise allowed me to observe, firsthand, the consumption patterns of pregnant and nursing women in this community. It also gave me the opportunity to experience women’s life in the Monteverde Zone and participate in their daily activities, such as washing clothes, cooking, cleaning and discussing topics ranging from Michael Jackson’s death to gender roles in the Monteverde Zone. Participant-observation helped

me to fulfill an important project goal, observing, firsthand, if women adhere to traditional dietary practices or not.

Informally, I participated in community events and spent many hours with one informant as we developed a strong friendship. I attended the local farmer's market weekly to have breakfast and socialize with community members. This event was both run and attended by the local community and was held at the high school gymnasium in the center of town. I attended other special events in the community, such as a baptism, child's birthday party and the town bingo event. Spending time participating in community events and speaking with community members about a wide-range of topics contributed to my understanding about local social roles and community life in the Monteverde Zone.

### Quantitative Methods

Quantitative data is "are presented numerically and manipulated statistically" (Rossman and Wilson 1985:628) and is the foundation for scientific inquiry (Rossman and Wilson 1985). Although this approach was regarded as superior for many years, triangulation of both quantitative and qualitative methods have proved to be an important approach for many disciplines. Although this study emphasizes the collection of ethnographic data, the biocultural nature of the underlying themes calls for the integrations of both methods. For this investigation I collected 24-hour diet recalls to assess the nutritional intake of my study participants, paying special attention to the types of foods they were eating and why.



### Structured Interviews: 24-hour Diet Recalls

I administered twenty-four hour diet recalls to study participants who were included in the participant-observation exercise. Although this type of structured interview has been criticized for producing inaccurate results, it has been reported that increasing the frequency of recalls improves accuracy (Bernard 2006). Twenty-four hour recalls were administered to each participant twice, non-consecutively within a seven-day period. This interview is designed to assess consumption and nutrition. For this investigation 24-hour diet recalls allowed me to see what women were eating on a daily basis, and combined with my personal observations, were designed to provide me with a comprehensive understanding of what pregnant and nursing women were actually eating. I was then able to assess whether they were adhering to locally reported maternal dietary practices. This exercise also provided data so that I could run a two-day nutritional analysis for my study participants, allowing me to identify any health concerns.

### Data Collection

#### Study Approval

This study was approved by the Institutional Review Board at the University of Nevada, Las Vegas, protocol #0905-3100 and was approved May 29, 2009. Approval was also granted by the Monteverde Institute (the local authority regarding social science research at the field site) on April 22, 2009.

#### Participants

Participants for this study were recruited using street-intercept sampling, a sample from an ongoing University of South Florida (USF) study funded by the National Science Foundation (NSF) (grant BCS 0753017), and by convenience sampling.

Survey participants were recruited using street-intercept sampling. Three streets intersect and denote the downtown Santa Elena area. I numbered the streets from 1 to 3 on individual pieces of paper and put them on a table. On days when I would gather survey data, I would mix the papers around on a desk and pick one with my eyes close, at random. I would then stand on that street for one hour. I invited every person I came in close contact with to participate in my survey. Criteria for survey participation were that respondents be 18 years of age or older, that they were *tico* (local word for a person who is from Costa Rica) and that they live in the Monteverde Zone.

I recruited focus group participants using the USF/NSF study sample. Women on the sample list were called in the order in which their name appeared, and asked to participate in this study. In order to participate, women had to meet certain criteria. First, all women had to be 18 years of age or older. Second, women either had to be pregnant or have children younger than 10 years of age, or have children between 20 and 30 years of age.

Recruitment of participants to take part in participant-observation and 24-hour diet recalls was done through convenience sampling. Snowball sampling was used to recruit women for this exercise. Snowball sampling has been criticized due to the lack of generalizability that results from a nonrandom sample as well as the bias involved with including only people who are involved within social networks (Faugier and Sargeant 1997). Due to the time constraints placed on this investigation, I feel that snowball sampling was the most appropriate method to employ. Individuals, who I met in the community or through the focus groups, referred me to friends or family that met the

criteria for participant-observation. In order to participate, individuals had to be female, 18 years of age or older and either pregnant or nursing.

### Consent

All participants were given a full verbal explanation of the investigation and their role and responsibilities as a participant. Survey participants provided verbal consent for their participation and all other participants read and signed an informed consent. I made myself available before and after all segments of the investigation for questions or comments from participants. I also gave all study participants my business card with a local phone number so that they could contact me at a future date with any comments, questions or concerns that they might have.

### Analysis

Survey analysis was done using SPSS version 17. I ran descriptive statistics to obtain response percentages for each question. I also used the Pearson's Chi-squared test to identify associations within the data. Focus group transcriptions were coded and categorized by dietary themes. Maternal dietary taboos, prescriptions, cravings and post-partum diet were used to organize data. The same method was used to code and organize my notes from participant-observation, although I included more categories such as birth experiences and sources of pregnancy/nursing information. Diet recalls were analyzed using the ESHA Food Processor: Nutrition Analysis and Fitness Software, version 7.9.

### Conclusion

Overall, methods for this investigation were designed to address the research questions at hand. To identify local beliefs about dietary practices during pregnancy and nursing, surveys were administered to the community under study. Observing whether

these practices were adhered to was carried out through participant-observation and during this exercise 24-hour diet recalls were also administered to build a broader picture of what pregnant and nursing women are consuming on a regular basis. Lastly, to identify any changes in maternal diet since tourism became more popular, two focus groups were completed. Triangulation of these methods successfully addresses the biocultural nature of the research inquiries, enabling broader implications to be made as a result of the investigation under discussion.

## CHAPTER 4

### FINDINGS OF THE STUDY

#### Surveys

The purpose of administering surveys for this investigation was to identify local dietary norms during pregnancy, nursing and the post-partum period, referred to as *cuarentena*, within the Monteverde Zone. Survey questions were designed to elicit information from community members about traditional dietary practices that fall into the previously mentioned categories, food taboos, dietary prescriptions, food cravings and a specified post-partum diet.

Forty-five surveys were administered to adult men and women currently living in the Monteverde Zone, Costa Rica. The majority of the sample is female (See table 1) and over half of the respondents have lived in the Monteverde Zone for more than 20 years. Most of the sample, with the exception of 3 respondents, lives in or near the main town center, Santa Elena, which is heavily immersed in tourism. Although there are numerous communities within the Monteverde Zone, there is only one community that has a large town center (Santa Elena) equipped with a chain supermarket, pharmacy and other facilities that cater to tourism. The mean age of participants is 35 years old (see table 1), indicating that they are of childbearing age, and, in fact the majority of them have children (67%), implying that they are well-suited to answer questions about current, local dietary practices during pregnancy, nursing and *cuarentena*. Although the sample is small and not statistically representative (n=45), the fact that 75.6% of the sample has lived in the Monteverde Zone for more than 5 years, and a greater percentage of the sample are women (60%), both work to improve the validity and accuracy of the

responses. Often, when I approached men on the street to participate in the survey they accepted until I explained the nature of the questions. I was repeatedly told that information about pregnancy and nursing was something “only women know” or that they couldn’t help me because they have never, and will never, be pregnant or nursing. Of the men that did participate, many responded, *I don’t know* to questions about diet during pregnancy, nursing and *cuarentena*. A Pearson’s chi-squared test was used to determine whether there was a significant relationship between gender and responding *I don’t know* to the survey questions about diet during pregnancy, nursing and *cuarentena*. With a confidence interval of 95%, gender (male) was significantly associated with respondents answering *I don’t know* when asked about foods that should be avoided during *cuarentena* or nursing, foods that should be avoided during pregnancy, and foods that should be consumed during *cuarentena* or nursing (see table 2). These associations verify claims made by my female participants about the nature of gender relations in the community and the strong presence of *machismo*, which is a masculine gender role associated with Latino culture, and includes attributes of hypermasculinity, such as not showing weakness or emotion (Torres et al. 2002). This reflects the opinion in the community that women know more than men about customary diet during pregnancy, nursing and *cuarentena*, therefore a sample of mostly women is appropriate for getting at current ideas in the community about diet during gestation and the post-partum period. When respondents were asked, “where do women receive information about the best foods to eat during pregnancy and nursing?” the most common answer was from a government-run agency or location (see table 3). This includes the local clinic, *puerto de salud* (health post/clinic), *centro de salud* (health post/clinic), control (the name given to

monthly prenatal visits required for each woman) *seguro*, CCSS (Caja Costarricense de Seguro Social), *la CAJA*, and the *EBAIS*. The last four responses refer to the national health agency, which runs all local clinics and health posts. The next most common response was a media source, such as magazines, television programs, the Internet and books. The third most common response was the family, indicating that most people get their information about diet during pregnancy, nursing and *cuarentena* from the government or from the media. Just over 10% of the sample responded that they get information from family, and even fewer (6.7%) get information from friends. Other responses were “gynecologist”, “hospital”, “nutritionist”, “local talks” and “high school”.

TABLE 1 SURVEY TRENDS: DESCRIPTIVE STATISTICS		
N= 45	Frequency	Percentage of sample
<u>Gender</u>		
Female	27	60%
Male	18	40%
<u>Age</u>		
Range	19-72	
Mean	35.5	
<u>Children</u>		
Yes	31	68.9%
Mean	2.2	
No	14	31.1%
<u>Years in the Monteverde Zone</u>		
< 5	9	20%
6-10	3	6.7%
11-20	7	15.6%
>20	24	53.3%
N/A	1	2.2%
Missing	1	2.2%

TABLE 2 RESPONSE OF "I DON'T KNOW" BY GENDER			
QUESTION	GENDER	FREQUENCY	SIGNIFICANCE
Where do women obtain information about the best foods to eat during pregnancy and nursing?	Male	2	0.076
	Female	0	
Which foods are best to eat during pregnancy?	Male	2	0.329
	Female	1	
Which foods are not good to eat during pregnancy?	Male	8	0.003*
	Female	2	
Which foods are common cravings during pregnancy?	Male	2	0.076
	Female	0	
Which foods are best to eat during <i>cuarentena</i> and while nursing?	Male	9	0.001*
	Female	2	
Which foods are not good to eat during <i>cuarentena</i> and while nursing?	Male	6	0.026*
	Female	2	
*Confidence interval 95%			



<b>TABLE 3</b> <b>SURVEY TRENTDS: SOURCE OF INFORMATION ABOUT WHAT TO EAT DURING PREGNANCY</b>		
<u>SOURCE</u>	<u>FREQUENCY</u>	<u>PERCENT OF SAMPLE</u>
STATE	35	77.80%
MEDIA	8	17.80%
FAMILY	5	11.10%
FRIENDS	3	6.70%
GYNECOLOGIST	2	4.40%
HOSPITAL	2	4.40%
NUTRITIONIST	2	4.40%
TALKS	2	4.40%
HIGHSCHOOL	1	2.20%
<b>**Frequencies exceed the total sample size because respondents provided more than one answer for this question**</b>		

When asked about foods that should be consumed during pregnancy the overwhelming response was fruits (77.8%) and/or vegetables (57.8%), and the next most common was meat (15.6%). The rest of the responses were varied and included specific nutrients found in food items rather than whole foods. Examples include “iron,” “fiber,” “calcium,” “vitamins,” “protein,” and “folic acid”. When asked why these things are good to eat, responses were generally vague, such as, they are “healthy”, “healthy for the baby”, “nutritious”, “nourishing”, “help with normal growth” and development of

the baby, they “have nutrients”, “provide energy,” “help to stay hydrated”, are “fresher” or they are “cleaner”. The most common responses when asked about foods that should be avoided during pregnancy were “fats” (37.8%), alcohol (20%) and salt (8.9%). Some respondents (8.9%) answered with items they believed to be abortive, such as coconut water and linseed (flax seed). Other responses included junk food, fast food, coffee and smoking. When asked why these foods should be avoided during pregnancy, responses were varied, in some instances being general and vague, and in others, quite specific. Participants said things such as, “they affect the growth of the baby”, they are not good for health, they will make you fat, they will damage the baby, they will cause complications, or they will cause problems with development. Some participants were very specific in their responses and said things such as, *chile* (pepper) and fats will be harmful to the baby’s skin when they are born”, fats will cause cholesterol to rise, fats will cause you to gain too much weight or that alcohol affects brain growth and can cause damage.

Respondents were also asked about foods that should be consumed during *cuarentena*. Almost half of the sample participants (20 respondents) either did not answer this question or responded with *I don’t know*. As locals continually rely on the clinic for information about diet during pregnancy and nursing, it is possible that traditional customs regarding *cuarentena* are becoming less common. Of those who did respond to this question, the most common responses were, vegetables (17.8%), fruits (15.6%) and liquids (11.1%). Participants also responded with things such as rolled oats or cereals to help produce milk. Half of the respondents (22) either did not respond or said *I don’t know* when asked why these foods are good to eat. The next common

responses were so they could help produce milk or that they are healthy for the mother and baby.

Participants were also asked about foods that should be avoided during *cuarentena* and the most common responses were beans (33.3%), cabbage (22.2%) fats (15.6%) and meat (13.3%). Respondents overwhelmingly said that these foods would cause colic in the baby or infection in the mother. Infections were referred to being linked with c-section or episiotomy recovery.

When asked about common food cravings during pregnancy, most respondents drew on personal experiences, speaking directly about themselves and their partners. As a result of this the answers were much more varied than the responses to the other questions. The most common responses were: cravings are distinct for each woman (17.8%), anything (15.6%), and acidic foods (i.e. fruit with salt or unripe fruit) (13.3%). Other responses were, chocolate, ice cream and sweets. Only two respondents said *I don't know*.

#### 24-hour Diet Recalls

In order to obtain current information about what pregnant and nursing women in Monteverde Zone are eating on a regular basis, 10 24-hour diet recalls were completed by local women. I interviewed 5 women from the Monteverde Zone, three were pregnant and two were nursing at the time of the study. I used The Food Processor nutrition and fitness software by ESHA to complete dietary analysis and examined the data from two angles. First, I divided the women into two groups; pregnant (n=3) and nursing (n=2), and compared the dietary intake of each group of women to the current dietary reference intakes (DRI) established by the United States government (2001) for pregnant or

nursing women between the ages of 31 and 50. Although two pregnant women and one nursing woman were under the age of 31, the DRI's did not differ enough to use the younger age group for comparison. Second, I compared the dietary intakes of women living in a more rural, agricultural community in the zone to women living close to the town center of the zone, where tourism is most active. Although the sample size (n=5) is small and in no way generalizable to the overall population in the area, comparing recalls among women is valuable to research efforts looking at similar issues, and may provide a starting point for future initiatives in the area.

#### Pregnant and Nursing Dietary Intakes

Overall, the pregnant women in my sample were not meeting their daily caloric needs (see figure 1). They were taking in about 2019.80 calories, which is 88% of the DRI for pregnant women. As recommended by the U.S. government, the DRI for daily calories is 2,500 calories during the second and third trimester. Although other sources (Insel et al. 2006) have recommended up to 2,852 calories per day for women in their third trimester, I am using the U.S. government standards because *The Food Processor* software uses similar standards for comparative analysis. It is important to note that *The Food Processor* software does not account for cross-country variation in fortified foods, therefore, some measures may be off. Fortified foods that I am aware of will be commented on below. The lower than recommended daily caloric intake could be a result of underreporting, since two of my participants were overweight and told me that at their prenatal visits the doctor or nurse advised them to maintain their weight and not gain too much. It could also be that these women were consciously cutting calories in order to maintain their weight. One pregnant woman in my sample had very limited

access to resources, and although she reported consuming the most calories in the sample (2210), she may have over reported intakes for the study.

It is important to note that women are only getting about half of the necessary iron and folate from their diet, but that they reported receiving folate and iron supplements from the clinic and they reported taking these supplements daily. Also, wheat flour and corn flour is fortified with folic acid in Costa Rica (Chen and Rivera 2004), therefore it was hard to get an accurate measurement of how much folic acid is consumed in the diet. It is also interesting to note that although Iodine intake is low for both pregnant and nursing women, through participant observation, I found that women underreported their use of iodine-fortified salt.

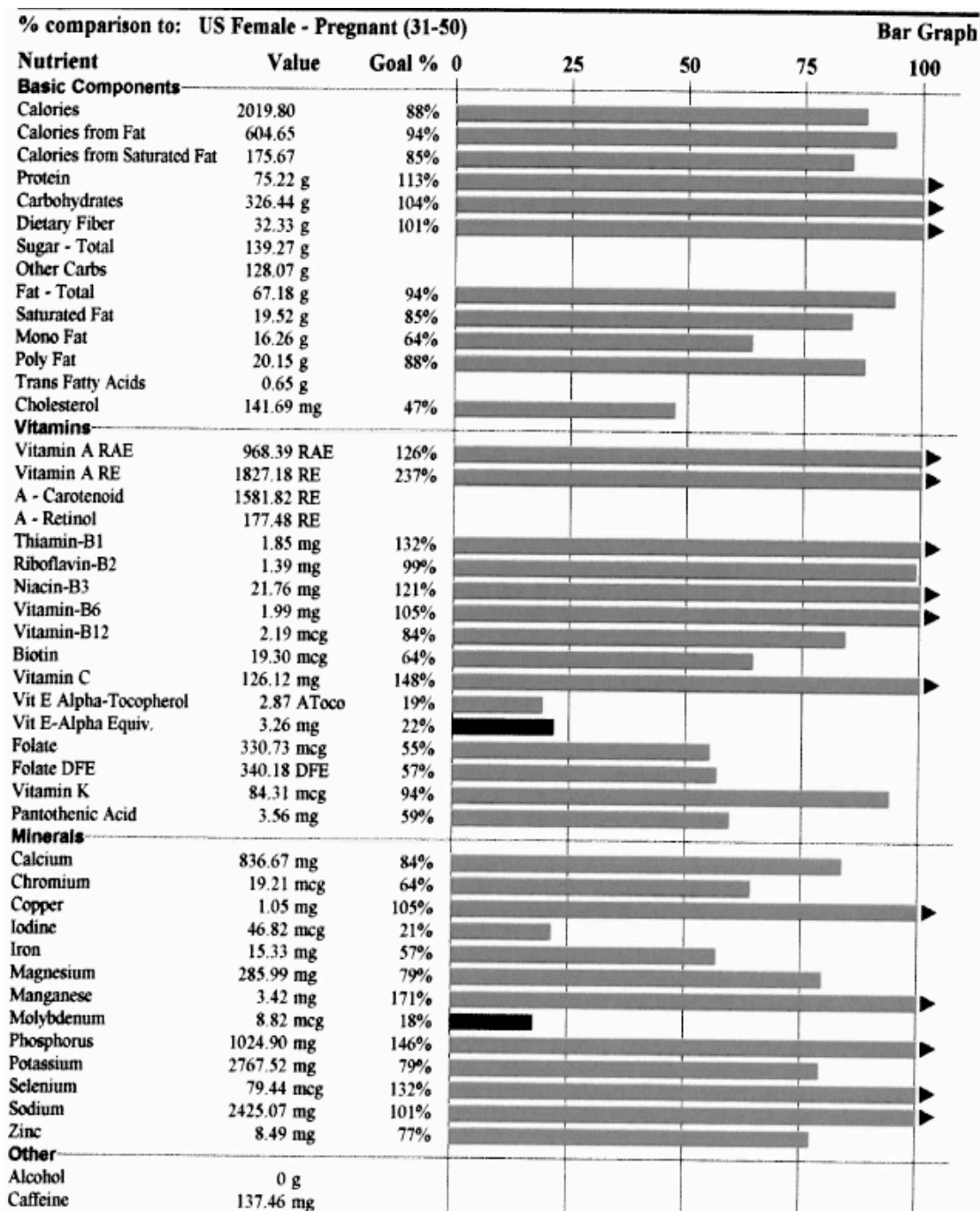


Figure 1

Dietary Intakes for Pregnant Women Compared to the DRI (Daily Recommended Intake) for Women in the U.S.

It is surprising that women only consumed 84% of their daily calcium needs because the presence of the cheese factory in the community ensures the availability of yogurt, milk and cheese on a regular basis. One woman from the sample reported drinking milk and eating yogurt from the factory, while another has cows and makes her own yogurt and cheese. Given the reported low intake of calcium, however, it is no surprise that the women in my sample also did not meet the DRI for B-12 (84%), since B-12 is found in beef, pork, milk products and seafood. Two of the three pregnant women reported eating beef. The other woman did not report eating beef and although I suspect that this is due to the limited resources available to her, it is unclear what the reasons for this are. The pregnant women in my sample also did not meet the DRI for zinc (77%), found in beef sources, seafood, dark chicken meat, yogurt and fortified foods. Potassium intake was similar across the board (79%), potentially due to the lack of certain dairy products in the diet.

For the most part, nursing women exceeded the DRI's (see figure 2). However, there are a few vitamins and minerals that do not meet the DRI's and may be of concern. Nursing women are not meeting the DRI for Vitamin A RAE (retinol activity equivalent), and are only getting about 37% of what is recommended. They are also only getting about 57% of the folate that is recommended daily, but again, because the flour is fortified, it was hard to get an accurate measurement of how much folic acid is consumed in the diet. This may be concerning since these women are no longer receiving supplements from the clinic and did not report consuming folate supplements after pregnancy. Nursing women in this sample are getting 83% of B-6 and 87% of the DRI for zinc. It is important to note, again, that women are reporting only getting 22% of

the DRI for Iodine, but that through participant observation I saw that salt intake was much higher than reported. Both groups of women were in the appropriate range for caffeine intake, which is less than 200 mg.

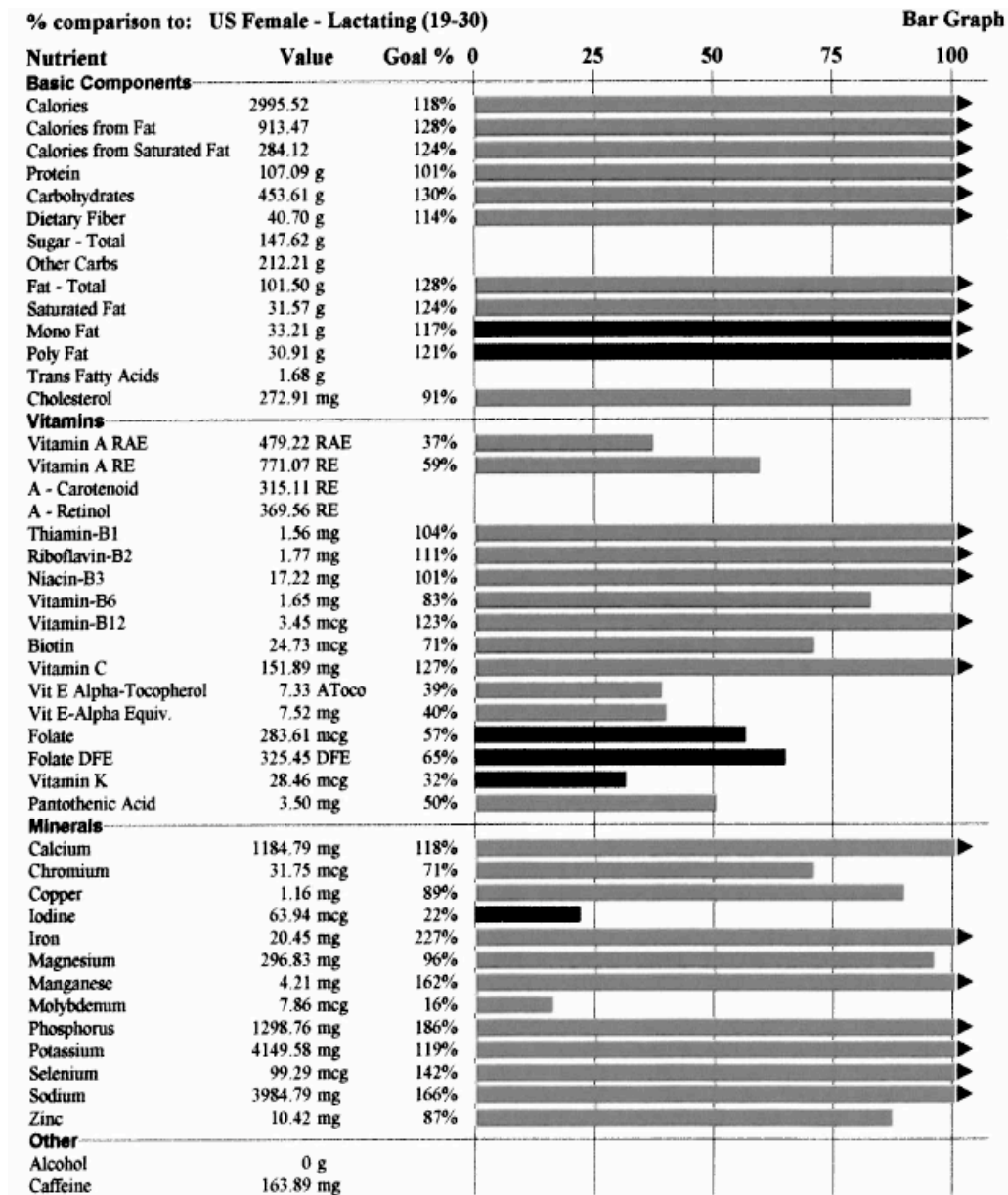


Figure 2  
Dietary Intakes for Nursing Women Compared to the DRI (Daily Recommended Intake)  
for Women in the U.S.



## Rural/Agricultural vs. Town/Tourist center Dietary Intakes

When comparing the dietary analysis for women living in the rural, agricultural community versus the communities closest to the tourist/town center some noteworthy differences in macronutrient and vitamin intake arise (see table 4 and table 5). First, women who live in the communities closer to the tourist/town center, on average, are consuming 800 more calories a day than those living in the more rural areas. This could be related to access to food resources. The tourist/town center has a chain supermarket and many smaller, local supermarkets in the vicinity. In the rural area, there is one small store that has limited food items and many people gather food from the farms or fruits from around their house for use. There is also a marked difference in protein intake, 74.30 g in the rural community vs. 97.08 g in the town communities. It is clear that access to meats are somewhat limited in the rural community, therefore I would attribute this difference to the access to and affordability of meat and dairy products. This inference is supported by the difference in dietary cholesterol between the two groups. The rural community, on average, takes in about 127.22mg of cholesterol per day, while the town group is taking in almost double that at 238.81mg per day. This also supports the finding that the women in the town communities are consuming about double the amount of B-12 as women in the rural community. Also associated with this finding, is that women in the town communities are consuming almost three times the amount of calcium as the women living in the rural community. Folate intakes are similar and both below the DRI for adult females (at 79% and 77% respectively), but again there is the issue of food fortification. The only nutrient that the women living in the town

communities consumed less of than women in the rural community is Vitamin A RAE.

This could be because they are including more store-bought and processed foods in their diet, compared to the women in the rural group, who are consuming mostly farm foods, including a lot of fresh fruits and vegetables.

**TABLE 4 (n=3)**  
**DIETARY INTAKES FOR WOMEN**  
**LIVING IN OR NEAR THE**  
**TOWN/TOURIST CENTER**

Nutrient	Value
<b>Basic Components</b>	
Calories	2729.36
Calories from Fat	792.49
Calories from Saturated Fat	266.33
Protein	97.08 g
Carbohydrates	428.70 g
Dietary Fiber	35.90 g
Sugar - Total	176.58 g
Other Carbs	178.13 g
Fat - Total	88.05 g
Saturated Fat	29.59 g
Mono Fat	26.20 g
Poly Fat	22.85 g
Trans Fatty Acids	1.51 g
Cholesterol	238.81 mg
<b>Vitamins</b>	
Vitamin A RAE	505.12 RAE
Vitamin A RE	822.96 RE
A - Carotenoid	389.24 RE
A - Retinol	342.42 RE
Thiamin-B1	1.49 mg
Riboflavin-B2	1.76 mg
Niacin-B3	16.16 mg
Vitamin-B6	1.80 mg
Vitamin-B12	3.39 mcg
Biotin	23.37 mcg
Vitamin C	173.97 mg
Vit E Alpha-Tocopherol	6.12 AToco
Vit E-Alpha Equiv.	6.29 mg
Folate	308.07 mcg
Folate DFE	349.61 DFE
Vitamin K	25.24 mcg
Pantothenic Acid	3.62 mg
<b>Minerals</b>	
Calcium	1328.33 mg
Chromium	26.69 mcg
Copper	1.05 mg
Iodine	80.11 mcg
Iron	17.83 mg
Magnesium	283.65 mg
Manganese	3.38 mg
Molybdenum	8.74 mcg
Phosphorus	1193.81 mg
Potassium	4068.60 mg
Selenium	85.56 mcg
Sodium	3304.59 mg
Zinc	9.61 mg
<b>Other</b>	
Alcohol	0 g
Caffeine	132.17 mg
Choline	-- mg

**TABLE 5 (n=2)**  
**DIETARY INTAKES FOR WOMEN**  
**LIVING IN THE RURAL,**  
**AGRICULTURAL COMMUNITY**

Nutrient	Value
<b>Basic Components</b>	
Calories	1931.18
Calories from Fat	631.72
Calories from Saturated Fat	148.13
Protein	74.30 g
Carbohydrates	300.21 g
Dietary Fiber	35.34 g
Sugar - Total	91.67 g
Other Carbs	137.11 g
Fat - Total	70.19 g
Saturated Fat	16.46 g
Mono Fat	18.31 g
Poly Fat	26.87 g
Trans Fatty Acids	0.39 g
Cholesterol	127.22 mg
<b>Vitamins</b>	
Vitamin A RAE	1174.14 RAE
Vitamin A RE	2277.40 RE
A - Carotenoid	2103.99 RE
A - Retinol	122.14 RE
Thiamin-B1	2.10 mg
Riboflavin-B2	1.22 mg
Niacin-B3	25.62 mg
Vitamin-B6	1.93 mg
Vitamin-B12	1.65 mcg
Biotin	18.62 mcg
Vitamin C	80.11 mg
Vit E Alpha-Tocopherol	2.46 AToco
Vit E-Alpha Equiv.	2.99 mg
Folate	317.60 mcg
Folate DFE	311.30 DFE
Vitamin K	117.07 mcg
Pantothenic Acid	3.41 mg
<b>Minerals</b>	
Calcium	447.30 mg
Chromium	20.53 mcg
Copper	1.16 mg
Iodine	14.00 mcg
Iron	16.69 mg
Magnesium	300.34 mg
Manganese	4.26 mg
Molybdenum	7.98 mcg
Phosphorus	1045.40 mg
Potassium	2197.96 mg
Selenium	90.11 mcg
Sodium	2665.51 mg
Zinc	8.74 mg
<b>Other</b>	
Alcohol	0 g
Caffeine	171.83 mg
Choline	-- mg

### Focus Groups

The purpose of using focus groups for this investigation was to address if, and how, maternal diets have changed since the popularity of tourism has increased in the Monteverde Zone. Two focus groups were conducted with older and younger mothers. Group one included adult women (n= 5) who have at least one child younger than 10 years of age and group two included women (n=6) who have at least one child between the ages of twenty and thirty years of age. Both groups were asked questions about diet during pregnancy and the post-partum period (*cuarentena*) (see Appendix 1) (e.g. *where do women get information about diet during pregnancy and cuarentena?*, *what foods are good to eat during pregnancy and cuarentena?*, *what foods are bad to eat during pregnancy and cuarentena?*, *what foods are commonly craved by women during pregnancy and cuarententa*, and *where do women get information about diet during pregnancy and nursing?*). Once the data had been collected I was able to identify similarities and differences across group responses.

Throughout each focus group women were encouraged to contribute to a free listing activity, listing all the foods they could think of that were appropriate responses to each question. To begin each session, women were asked about foods that were commonly consumed during pregnancy. Although some women gave general responses to add to the list of foods, most women drew on their personal experiences, discussing them with the group. Of all the questions, food items were most similar between groups in response to the first question (see table 6). The older women discussed food items that were essential for providing nutrients, such as iron, and commented that women today are given supplements to maintain a healthy intake of iron and folic acid. They agreed

that when they were pregnant these services were not offered. The older mothers also discussed common foods as being “natural” and “from the house,” implying that they produced many of the foods that they ate. The older mothers made a clear distinction between what life was like when they were pregnant and life in Monteverde now. One woman commented,

“[I]n general, in that time, there weren’t many restaurants or hotels in Monteverde, so most of what some one ate came from the house, chopped dishes [chopped vegetables and meat], vegetables, normal food, right. Not like now, when some one has a craving for something like pizza or they are craving fried chicken, and all of that, no because what some one made, they would make in the house, those places didn’t exist then like they exist today.”

Older women also agreed that linseed (flax seed) was commonly consumed during the

<b>TABLE 6</b> <b>FOODS COMMONLY CONSUMED DURING PREGNANCY</b>	
Younger Mothers (with children younger than 10 years old)	Older Mothers (with children between 20 and 30 years old)
Milk Crackers/cookies Vegetables Meat soup Fruits/fruit salad (strawberries, grapes, watermelon) Bananas Acidic foods (lime, ceviche) Dessert Whole grains/wheat Tortilla Omelet Sweet potato Peanuts “Everything”	Milk Crackers Vegetables Meat soup Grapes Plantains Lime Ham with black guinea for the iron Spinach <i>Chilote</i> Chicken Green beans Red meat for iron Cheese “Natural” “From the house” (chopped mix, vegetables) Linseed (flax) (to help the birthing process)

last stages of pregnancy to help make birth easier. They agreed that linseed should not be consumed too early in pregnancy because it can be harmful. I learned from the survey responses that this was considered to be abortive.

When asked about foods commonly consumed during pregnancy, the younger mothers agreed that women eat “everything” during pregnancy and discussed personal experiences that many of them had with excessive weight gain. One woman revealed that her child was overweight at birth, due to her excessive eating during pregnancy. They agreed that women “eat more freely” and “eat just for the sake of eating” when they are pregnant. They acknowledged that sedentary behaviors during pregnancy may have contributed to their excessive weight gain. They also agreed that they had trouble losing weight after their pregnancies and remained heavier than they were before they were pregnant.

Not surprisingly, when asked about foods that are commonly avoided during pregnancy, younger mothers only listed one food item that should be avoided (see table 7).

<b>TABLE 7</b> <b>FOODS THAT SHOULD BE AVOIDED DURING PREGNANCY</b>	
Younger Mothers (with children younger than 10 years old)	Older Mothers (with children between 20 and 30 years old)
<i>Chiles</i> (peppers)	Sodas Alcohol Cali flour Cabbage

One younger mother explained that if you eat *chiles* (peppers) during pregnancy that your child will come out with burned (reddish) skin. Older mothers did not discuss reasons listing the food items for this question. They did, however, spend a good portion of their discussion talking about food cravings during pregnancy and sharing their experiences with one another.

When asked about common food cravings during pregnancy, responses between the two groups show some marked differences in types of food items (see table 8). Both groups mentioned that traditional belief prescribes that a “woman should eat everything they crave during pregnancy or the baby will be born with an open mouth.” Younger mothers reported eating foods commonly store-bought or found in or near the town center. The majority of foods items that older mothers reported eating (with the exception of beer foam and paint) are natural products that are often found on the farm. They openly discussed how things have changed because now their children enjoy eating at places in town that offer things like fried chicken and French fries. One woman said, “we never ate like that, not like fast food, or junk foods.”

<b>Table 8</b> <b>FOOD CRAVINGS</b>	
Younger Mothers (with children younger than 10 years old)	Older Mothers (with children between 20 and 30 years old)
Beer Paint Coca Cola Tacos (fried) French Fries Junk foods	Spoonful of paint Entire fish, big and fried Fried ham Pot-cooked chicken Goat's milk Honey

Interestingly, the only items listed by both groups were beer (or beer foam) and paint. The majority of women in both groups admitted that they craved beer during pregnancy; although only some actually indulged in a beer, sip of beer or beer foam. The younger mothers discussed stories they heard about women eating paint because they had an iron deficiency, although none of them actually ate paint, or knew anybody that craved or ate paint during pregnancy. On the other hand, one of the older women recalled that when her mother was pregnant, she was asked to go across the street to buy a can of paint. When she returned, she watched her mother take a spoonful of paint and eat it! She also attributed this to her mother having an iron deficiency.

When asked about foods commonly consumed during *cuarentena*, women from both groups listed a few common foods items (see table 9) such as rolled oats, chicken soup, and concoctions that would help clean uterine blood.

<b>Table 9</b> <b>FOOD COMMONLY CONSUMED DURING <i>CUARENTENA</i></b>	
Younger Mothers (with children younger than 10 years old)	Older Mothers (with children between 20 and 30 years old)
Rolled oats-to produce milk Chicken soup Rosemary tea to clean the blood	Rolled oats- to produce milk Chicken soup Guaro (homemade alcohol) with 2 parts honey- to clean the uterus Chamomile and honey Chamol (a tuber) Cucumbers Tortilla Rice Sweet water with milk



Both groups agreed that rolled oats were effective in helping mothers to produce milk and that chicken soup was a traditional food that should be eaten right after giving birth. Agents to clean the uterine blood varied between the groups, including rosemary tea, *guaro* (homemade alcohol) with honey, and chamomile with honey. The older women listed additional food items that they commonly ate during *cuarentena*, but did not discuss any reasoning behind their choices.

When asked about foods that should be avoided during *cuarentena*, food items varied, although the reasons foods should be avoided were similar (see table 10). Overwhelmingly, women in both groups listed food items that could cause colic (gas/irritation) in the baby or cause discomfort to the mother. Younger mothers also identified items that may cause infections if a woman had a c-section, such as meat, sour cream and beans.

<b>Table 10</b> <b>FOODS AVOIDED DURING CUARENTENA</b>	
Younger Mothers (with children younger than 10 years old)	Older Mothers (with children between 20 and 30 years old)
Cabbage-colic Avocado-colic Beans-colic(if c-section) Sour cream-(if c-section) Fish-develop allergies Soy-develop allergies Meat-(if c-section)	Cabbage-colic Cali flour- colic Black beans-colic Ripe plantains-colic Yuca- colic

Younger mothers also commented that although they believe that these foods can cause discomfort for both the mother and the child, the hospital serves these food items after they have given birth, implying a conflict of ideas about what is appropriate to eat during *cuarentena*. One identifiable difference is that younger mothers also discussed food items that may cause the child to develop allergies, such as fish or soy. One woman spoke about the potential of soy to promote the rapid growth of young girls.

I also asked women directly where they received information about diet during pregnancy and nursing. Younger mothers said they receive information from family, mothers-in law, mothers, high school and from the television. Throughout the focus group, the younger mothers alluded to information or help from their mothers or mothers-in-law. In contrast, the older mothers alluded to receiving information from their mothers, mothers-in-law and grandmothers quite frequently throughout the discussion. When asked directly about this topic, women said that they received information from their mothers or that it was like an “experiment” and did not receive much information prior to their experience.

#### Participant-observation

The purpose of doing formal participant observation for this study was to observe daily consumption patterns of pregnant and nursing women in the Monteverde zone. Unfortunately, there were limitations that restricted me from obtaining this information, from all but one woman, first-hand. First, due to time constraints with each woman (2 days), I was unable to get a clear picture of what their normal diet was like. Some women already ate their first meal before I arrived and waited to make dinner for their families until after I left. Second, women did not fully understand what *participant-*

*observation* meant, and that as a researcher I was there to observe them while they carried on with their normal day. All of the women sat and talked with me for the duration of my visits, very cognizant of my presence as well as my research goals. Only one woman carried on with her normal activities and did not pay much attention to fact that I was there. As a direct result of this awareness, it is highly likely that women prepared healthier meals while I was present, ate less and underreported their intake of unhealthy foods.

Although I was unable to fully address one of my research questions (*are pregnant women adhering to traditional dietary behaviors?*) through participant observation, I was successful in building rapport with my participants. Sharing personal experiences and stories with my participants enabled me to understand what life is like for women living in the Monteverde Zone and the challenges they face in this time of transition. These experiences helped me to understand claims made during focus group discussions as well as interpreting the analysis from the 24-hour diet recalls.

#### Variation in Lifestyle Between Communities

I noticed variation in the lifestyles of women who lived in the rural community vs. the town/tourist center community. The women in the town/tourist center appeared to be more financially stable than the women in the agricultural community. Their homes were larger, with a more concrete infrastructure, and although all of my participants have televisions, the women who lived near the town/tourist center have additional high value items, such as stereo systems and gaming systems (i.e. playstation). Living close to the town/tourist center provided them access to resources whenever necessary. The closest local supermarket to each woman living near the town/tourist center was a short walk

away (5-15 minutes). Women living in this area had transportation, either directly (owning a car or motorcycle) or indirectly (someone else who had a car or motorcycle would give them rides), minimizing physical exertion and increasing sedentary behaviors. In the rural community, however, women were forced to walk most places unless a passerby was kind enough to give them a ride, but the traffic (both vehicle and on foot) was rare in this area.

For the women living close to the town/tourist center, this location also enabled them to increase their financial gains. One woman rented out cabins to tourists and foreigners, as well as sold clothing from her home. Due to her convenient location, women were often dropping by to try on and buy clothing. Another woman worked in the local (and only) pharmacy, which catered to both tourists and locals. The other woman who lived in this area did not work, but her husband worked in the cheese factory as an accountant. In contrast, for the women in the rural, agricultural community these opportunities did not come easily. One woman worked in the tourist/town center at an ice cream shop a few days a week, but walks two hours each way to get to town. She also walks into town to sell homemade baked goods to tourists. There is only one small store in this community with limited items.

The daily lives of the women who do not work are also very different between these two communities. In the town/tourist center, women spend the day in the house, cooking, cleaning, watching television, sitting with visitors and talking on the phone. The woman from the rural community that does not work also stays home with the children, cooking and cleaning, but these tasks are more arduous for her. She milks cows and makes yogurt and cheese and uses a wood-burning stove (when there is not money

for gas, as there was none when I was there) to cook. She keeps the fire burning all day so that she can prepare meals for her family. She also goes outside to look for eggs that the chickens have laid and sends the children to pick fruits like mangos and plantains.

## Diet

Although I was unable to gather comprehensive information on the daily diets of pregnant and nursing women in the Monteverde Zone, I did make some observations about consumption norms within my sample. The majority of women eat homemade tortillas with most meals, and all of the women eat rice and beans with all meals that were prepared in the home. A common snack for a few of the women is pancakes (*arrepas*) and it is common to drink coffee in the afternoon with a snack, such as pancakes or cookies. All of the women I worked with drank their coffee black with at least one tablespoon of sugar (in most cases more than 1 tablespoon). All of them also used soy oil for cooking (brand name Capullo). Two of the pregnant women told me that they were watching their daily intake because the doctor told them they were overweight. They were instructed to maintain their weights, but not to lose weight. The two nursing women, on the other hand, ate the most freely and the largest portions that I witnessed. One of them drank soda early in the morning and shared a mid-morning snack of cookies and tang with me. She was still breastfeeding her child at almost 4 years old, but was going to stop soon, she said. The other nursing woman was breastfeeding her child at 1 year, 8 months and was planning to stop at 2 years.

I had one informant with whom I spent a great deal of time. I noticed that at first she would offer to prepare meals for me and then would not eat, saying that she already ate before I came. As she became more comfortable with me, I had the opportunity to

observe her normal diet, day-to-day. I noticed that she used a lot of condiments, such as ketchup (*salsa de tomate*) and sour cream (*natilla*). I also noted that she ate two full plates at every meal that I shared with her, and that she was always trying to get me to eat more. At almost every meal rice and beans were present, and at many meals hand-made tortillas were consumed as well. For breakfast she would eat eggs, *gallo pinto* and tortillas. *Gallo pinto* is a signature dish in Costa Rica. It is made by pan-frying white rice, black beans, onion or green onion and sometimes tomato. This dish is a popular breakfast item throughout the country. A common lunch food for her was canned tuna fish, prepared with onion, tomato, garlic and limejuice, and served with rice and beans. She made this dish every couple of days. I was also present for meals such as homemade *empanadas* (made from home-made tortillas with shredded cheese inside) and packaged, frozen, breaded chicken with flavoring, pan-fried.

Although I was unable to obtain the detailed information that guided this segment of the investigation, I did observe some similarities and differences among women and noted some themes that are valuable to this study.

## CHAPTER 5

### DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

#### Discussion

Previous research in Costa Rica suggests that the country is experiencing the effects of both an epidemiological and nutrition transition (Himmelgreen et al. 2006;Martínez-Ortiz 2006). Past studies have focused on cardiovascular disease (Kabagme 2005;Martínez-Ortiz 2006), childhood obesity (Núñez-Rivas 2003), adult overweight and obesity (Agüero 2009), and adult mortality decline (Rosero-Bixby 1996) but extensive literature searches have not uncovered any published studies which have examined maternal overweight and obesity, or its implications in this nutritional transition state. As indicated by the 2008-2009 Costa Rican National health survey, administered by the national Ministry of Health, women of childbearing age (20-44 years old) have seen increased rates of overweight and obesity (indicated by BMI greater than or equal to 30) over the last twenty-five years. Rates have nearly doubled from 34.6% in 1982 to 59.7% in 2008-2009 (Agüero 2009). This is particularly problematic because of the increased health risk this poses, not only to women, but to their potential offspring as well. Although Costa Rica is a welfare state, offering free and accessible health care to all citizens, including a state-required monthly prenatal visit for all women, results from this study show that women feel they are not receiving adequate information about diet and nutrition from their local clinic or health post. Bridging this gap is vital to public health efforts that aim to improve maternal health and birth outcomes in the Monteverde Zone, especially during periods of rapid socio-economic change, when health may be especially at risk.

## Food Insecurity and DOHaD

Current studies employing the Developmental Origins of Health and Disease (DOHaD) paradigm have found that a poor maternal diet, defined here as either undernutrition (e.g. lack of macronutrient or micronutrient intake) or overnutrition (e.g., excess of total energy intake), in addition to maternal overweight and obesity, play significant roles in the development of obesity-related disorders throughout the lifecourse of offspring (Roseboom et al. 2001; Benyshek 2007). The results of this study revealed that the majority of participants admitted to being overweight during pregnancy and two participants acknowledged that their children were either born macrosomic (4000 grams) or close to the cut-off for macrosomia (3,098 grams). In areas undergoing rapid changes associated with the nutrition transition, like the Monteverde Zone, consumption patterns, diets and lifestyles are shifting, putting the community at risk for increased incidence of obesity and obesity-related disorders, as well as passing on disease risk to future generations (Popkin 2002; Rivera et al. 2004; Benyshek et al. 2006).

Over the last 15-20 years, the Monteverde Zone has been experiencing a shift from agricultural subsistence to a tourist economy, and in 2006 Himmelgreen et al. sampled women from the Monteverde Zone to assess impacts on food security. They found that both the communities under study (one agricultural community and one tourist community) had high rates of food insecurity, and that 37% of their sample was overweight, while 30% were obese. We can draw on other examples of the nutrition transition occurring in Latin America (Filozof et al. 2001; Jacoby et al. 2003; Mortarell et al. 1998; Olivares et al. 2004) to see that the potential adverse health outcomes are a



threat to community and reproductive health. Additionally, food insecurity has been linked to health risks for overweight and obesity in women (Dietz 1995; Shariff and Khor 2005; Townsend et al. 2000; Tanumihardjo et al. 2007; Olsen 1999; Adams et al. 2003), potentially explaining the co-existence of food insecurity and overweight/obesity in women in the Monteverde Zone. One study found that being overweight and food insecure in early pregnancy was associated with high risk for major weight gain during gestation and the post-partum period (Olsen and Strawderman 2008), increasing risks associated with excessive pregnancy weight gain and maternal overweight/obesity (Watkins et al. 2003; Stotland et al. 2006; Siege-Riz and Laraia 2006; Siega-Riz 2004; Nohr et al. 2008; Galtier-Dereure et al. 2000). There is also a growing body of literature concerning the emergence of dual burden households in transitional communities (Khor and Sharif 2003; Garrett and Ruel 2003; Florêncio et al. 2001; Doak et al. 2005; Doak et al. 2000; Angeles-Agdeppa et al. 2003), previously referred to as under/over households. These homes have individuals with two forms of malnutrition, underweight and overweight/obese (Doak et al. 2005). Seemingly paradoxical, this occurrence is becoming more frequent in transitional communities, where there has been a recent shift in diet and lifestyle (Florêncio et al. 2001). The nutrition transition is often accompanied by malnutrition and food insecurity, which provide pathways for the expression of poor health in the forms of overweight/obese and underweight in the same household (Garrett and Ruel 2003), posing an immense challenge to public health efforts. Although current research on food security is ongoing in this area, a comprehensive investigation, exploring all of the health outcomes previously mentioned would benefit both public health researchers and community members.

## Maternal Diet

Consistent with examples from other regions that have increased tourism (Godde et al. 2000; Leatherman and Goodman 2005; Daltabuit and Leatherman 1998), the Monteverde Zone has experienced rapid political-economic changes that have affected the daily consumption patterns and activity levels of many locals. Although the Monteverde Zone, situated high in the mountains of the continental divide, is considered a rural area, the main town/tourist center has developed rapidly in recent years. By no standards should this area be considered urban, although certain changes have altered consumption patterns within the local population. A chain grocery store opened in 2008, offering a variety of packaged and processed food items, along with the usual produce and meats. Residents living close to this area now have unlimited access to these items, the majority of which cannot be found at other local stores and are costly (Himmelgreen et al. 2006). Residents living in the rural community have limited access to these resources and rely more on what they grow for subsistence.

Results from this investigation show a clear split in nutritional intake between the rural, agricultural community and the communities close to the town/tourist center. This is most likely due to differential access to resources, such as dairy and meat products. Women who live further from the town/tourist center, in the rural agricultural community, have lower intakes overall of calories, protein, cholesterol, b-12 and calcium. On average, these women are consuming 800 calories less than the women living near or in the town /tourist center. It is possible that this is a direct result of limited access to resources, including financial resources. The distance from the town/tourist center restricts involvement in the tourist industry for many residents in the agricultural

community. For example, one informant with whom I worked always wanted to host a student in her home, for both the personal experience as well as for the much needed income. But because she lives so far from the town center and has five children to support, this not a possibility. Lower dietary intakes of protein, cholesterol, b-12 and calcium indicate that there is overall lower consumption of animal products. This was confirmed after analysis of the 24-hour diet recalls. Women in the agricultural community reported eating less meat and dairy products than women in the town/tourist center. This find was surprising because one of my informants in the rural community owns cows and chickens. She makes cheese and yogurt from the cow's milk and gathers eggs from the chickens. However, after observing her meals, I realized that intake of these items was low because she also had to feed five children with the yield from the cow's and chickens. This split was also apparent in the daily consumption that I observed through participant-observation. The homes I visited that had access to farmland included a variety of vegetables and fruits in their foods, such as chayote squash, plantains, mangos, guava, beets and limes. Meals in the homes without access to farmland consisted mostly of staple foods, such as rice, beans, tortillas and pancakes, although these items were found in all homes.

#### Changes in Maternal Diet

Compatible with characteristics of the nutrition transition (Popkin et al. 2002), results from the focus groups show that maternal diet has changed over the last twenty years to include energy dense, processed food items. Unfortunately, due to a lack of data regarding income and occupation, it is not possible to draw more finite conclusions about the mechanisms behind these changes, but since tourism became popular in the

area, many restaurants have opened, serving increasingly “western” foods, like fried chicken, French fries and pizza. Younger mothers in the focus group admitted to eating/craving food items such as coca cola, French fries, and junk foods, which are common “western” food items that can now be found in the town/tourist center and in many small grocery stores in the area. Older mothers in the focus group repeatedly discussed these changes and were unhappy with their children’s desire to eat these types of foods regularly. There is a clear preference for these types of foods by the young locals in my study, although women acknowledge that they are unhealthy. This indication of *dietary delocalization* has been cited in other areas that have experienced increases in tourism (Daltabuit and Leatherman 1998; Leatherman and Goodman 2005). *Dietary delocalization*, as described by Peltó and Peltó, refers to the “process in which food varieties, production, methods, and consumption patterns are disseminated throughout the world in an ever-increasing and intensifying network of socio-economic and political interdependency (1983:507).” Although the Monteverde Zone is still a transitioning community, food insecurity associated with the flux in the tourist season and the high prices of commodity food items (Himmelgreen et al. 2006) implies an increased reliance on non-local food items.

During participant-observation I saw women drinking soda early in the morning and recorded women eating snack foods such as *choco snacks*, a chocolate, packaged snack. Women frequently added packages of processed, powdered chicken consume to their cooking and used condiments, like ketchup. Given the limited amount of time I was able to spend with participants, it is also possible, perhaps even likely, that they were abstaining from eating unhealthy foods around me and underreporting consumption of

unhealthy food items, and this is a commonly noted drawback to using the 24-hour recall method (Bernard 2006). Although women have added foods to their diet, consumption is a mix of new, more “western” food items and traditional dishes and remedies. For example, one of my informants ate packaged items from the store during the day while she was at work in the town/tourist center, but continually drank a mixture called *mosote* when she was home. It consisted of plants from her mother-in-law’s farm mixed with water in a large container. She said that she drank some everyday and that it would help her with delivery.

One goal of this investigation was to identify local, traditional dietary patterns among pregnant and nursing women. I used food categories commonly cited in the ethnographic literature (dietary taboos, dietary proscriptions, food cravings and the recognition of a special post-partum period diet) (Shostak 1983; Van Hollen 2003; Fittin 1993; Dube 1949; Chan 1976; Carrecedo 1993; Bora 2002; Sich 1981; Pool 1986; Moller 1958; Maloney et al.) to design materials for this study. However, I found that those categories did not work well for use in this community. When I asked locals about these food categories while administering surveys, they had difficulty responding, and in many cases, they did not respond. I had a similar experience working with women one-on-one. In contrast, once I engaged with women about diet and nutrition during pregnancy and nursing they had a good deal to say. I also found that older women had more to say about these topics. Most likely this is because younger women get most of their information from the clinic, obviously informed by a perspective rooted in biomedicine. In accordance with focus group results, older women got most of their

information about diet during pregnancy and nursing from their families, a more traditionally rooted perspective.

Not only have diets been altered by the increasing influence of tourists visiting the region, but in fitting with the nutrition transition, lifestyles have changed dramatically as well (Uauy 2001; Albala et al. 2002), increasing sedentary behaviors for those heavily involved with tourism. During the focus group discussion with younger mothers in the Monteverde Zone, they spoke about eating a lot during pregnancy, but remaining quite sedentary, and they identified this as a problem for them and the community at large. Through my experiences, I noted that women who lived closer to the town/tourist center were more apt to get rides to places they needed to go, or would walk only short distances to get to their destinations. The women in my study who did not work outside the home, did not leave the home often, spending most of their day cleaning, cooking and caring for the children. In contrast, women living in the rural community were forced to walk more in general. For example, one informant walked her children to school every day, 30 minutes each way. Another one of my informants living in the rural community worked in the town/tourist center 3 days a week and would sometimes go to sell homemade food items on her days off. To get to the town center is a 2-hour walk each way, unless she is lucky enough to get a ride from a passerby. In general, increased transportation and access to goods at a relatively short distance have encouraged residents living in or near the town/tourist center to become more sedentary.

## Maternal Overweight and Obesity

In accordance with the findings of Himmelgreen et al., as well as those of the National Ministry of Health in Costa Rica (Agüero 2009), many of my participants admitted to being overweight during pregnancy. Of the five individuals who participated in the participant-observation exercise, 4 of them told me that they were overweight during their last pregnancy, and the two nursing participants told me that they were unable to lose weight after giving birth. One of those women admitted that she was not going to have any more children, but the other was unsure. Although excessive weight gain during pregnancy is an adequate marker of increased risk (Stotland et al. 2006; Nohr et al. 2008) studies have shown pregravid weight is also linked to birth outcomes (Siega-Riz and Laraia 2006). The younger mothers in the focus groups continuously brought up the theme of excessive weight gain during pregnancy, possibly due to the increased availability of snack foods, fried foods and sodas, as was mentioned earlier. They also agreed that they had trouble losing weight after their pregnancies, which could be problematic for their next pregnancy. As previously mentioned, the nursing women in my sample had an excess intake of calories on daily basis. Although they did not express any difficulty with breastfeeding, maternal overweight and obesity has been shown to interfere with lactation and breastfeeding practices (Donath and Amir 2008; Oddy et al. 2006; Manios et al. 2009). They did, however, express concern for the inability to manage their weight during and after pregnancy and the inadequate information about these issues that they received at the clinic.

## The Clinic

Common to many communities that use a biomedical model in health care there is a strong disconnect in the patient/provider relationship (Winkelman 2009) in Monteverde. Although the overwhelming consensus from the surveys was that women get information about diet during pregnancy and nursing from the local clinic, the focus groups and participant observation revealed that women are concerned that the clinic does not give detailed information. For some of the women that were overweight during pregnancy, they reported that the clinic told them to try and maintain their weight, but did not give them any tools to do so. Women told me that although the clinic would give them general advice (e.g. eat fruits and vegetables), they did not provide women with specific meals plans or ask them details about what they consumed. All women are required to attend a monthly prenatal visit called the *control*. One informant explained to me that it is called a control because this means that it is a routine visit, as opposed to being sick or in need of care. Once a month women are given folic acid and iron pills and were checked by either a doctor or a nurse. Surprisingly then, one informant confided in me that her friend experienced placenta previa, but that neither of them knew what this condition was prior to her experience. She told me that she now gets all of her information from an encyclopedia volume that some one lent her. It seems as though treatment is preferred over prevention. After giving birth women go for a few exams to ensure the health of the baby, but not for themselves. They are no longer given supplements and are not given advice on diet or nutrition. The women in my study who were nursing had adequate to excessive nutritional intakes of almost all nutrients and they admitted to being overweight. For women who are planning to conceive more



children, pregravid overweight/obesity is a potential threat to the welfare of their future pregnancies (Siega-Riz et al. 2006; Watkins et al. 2003).

On the other hand, I spoke informally with a clinic nurse and she explained everything that takes place during a monthly prenatal exam. She told me that they watch women's weight, and if necessary, they are referred to a nutritionist at the clinic for help. She also told me that women are given detailed information about what to eat during pregnancy and nursing and what foods should be avoided. During the focus group discussion with younger mothers, one woman admitted that there was a class offered by the clinic but that she didn't attend. There is an obvious gap between what the clinic nurse told me and what women from the community told me about the clinic. It is possible that the clinic is not following through with their procedures, or women are not adhering to what they are told. Either way, this is a major problem that should be addressed.

In conclusion, recent changes in the Monteverde Zone have clearly had an impact on maternal diet, although further research is warranted to understand the extent of these impacts. This is the first investigation to examine maternal health in a transitional community in Costa Rica, and although it is preliminary, the results obviously reveal that more work should be pursued.

### Conclusions and Recommendations

The communities within the Monteverde zone, Costa Rica have undergone rapid economic changes, as they have transitioned from agricultural subsistence to a tourist economy. This shift has resulted in changes characteristic of the nutrition transition, such as an increase in sedentary behaviors, as well as the addition of high-calorie, energy

dense items and packaged and processed foods in the diet. Although this community is still transitioning, health impacts are already apparent. There is a potential threat to maternal diet, as this pilot study has demonstrated, but hopefully the results of this investigation will raise awareness of some of these issues.

Women in the community identified excessive weight gain during pregnancy and more sedentary behaviors as an increasing problem in this region. Further research is warranted to understand the prevalence of maternal overweight and obesity, as well potential health impacts on both mother and child. The implications for the developmental origins of obesity-related disorders should be explored through efforts focusing on documenting actual weight gain during pregnancy, as well as birth outcomes (e.g. birth weight, childhood growth patterns, complications, etc). Retention of weight after pregnancy was also identified as a problem for many women in this study, and could influence subsequent pregnancy outcomes as well as impact women's overall health in the community. A key feature of the DOHaD paradigm is that there is strong potential for contributing to prevention and intervention strategies. Applying this model to research efforts within this community would not only identify current trends related to the developmental origins of obesity-related disorders, but would also contribute to community based public health strategies concerned with alleviating weight-related issues before they become too severe.

Another concern raised by almost all study participants was the issue of nutrition and diet during pregnancy. Most participants expressed the difficulty they had in obtaining specific information about diet and nutrition. As previously mentioned, there seems to be a shift in networks of information; women used to get information about diet

during pregnancy and nursing from their families (i.e. mother, mother-in-law, grandmother), but currently get most of their information from the clinic and media sources. Women are relying more on the clinic for information, but there was an overwhelming consensus that they are not receiving the kind of information that they need to maintain their health. Future public health efforts in this community should address this issue. Although resources are available for all women (i.e. free healthcare and required prenatal exams), these resources are not be utilized to their maximum potential. With the increasing reliance on the clinic as a source of information, it is important that women can access this information and use it to their benefit.

Overall, this pilot study identified key themes in maternal diet that should be addressed by future research efforts. In light of increased tourism in the area, as well as the implications of rapid development, public health concerns should acknowledge and confront impacts on maternal health, emphasizing the importance of preventative approaches, and minimizing health threats to subsequent generations. This strategy can be an effective tool for transitional communities by preventing the onset of serious health problems that, with increased prevalence can be unmanageable.

## APPENDIX 1

### RESEARCH TOOLS

#### Survey: Spanish

1. Género: M            F
2. ¿Ud. es tico?    Sí        No
3. ¿Cuánto tiempo ha vivido Ud. en Monteverde?  
< 5 años                      6-10 años                      11-20 años                      >20 años
- 3a. ¿Dónde vive Ud. en Monteverde? \_\_\_\_\_
- 3b. Si menos de veinte años, ¿dónde vivió Ud. anteriormente? \_\_\_\_\_
4. ¿Cuál es su fecha de nacimiento? \_\_\_\_/\_\_\_\_/\_\_\_\_
5. ¿De dónde es su familia?  
\_\_\_\_\_
6. ¿Ud. tiene hijos?    Sí                      No  
    6ª. Si Ud. tiene hijos, ¿Cuántos años tienen sus hijos?  
    \_\_\_\_\_
7. ¿Dónde obtienen las mujeres información sobre las mejores comidas para comer durante el embarazo y darle pecho?  
\_\_\_\_\_
8. ¿Cuáles comidas cree Ud. que son mejores para comer durante el embarazo?  
\_\_\_\_\_  
    8ª ¿Por qué?  
    \_\_\_\_\_
9. ¿Hay algunas comidas que nunca se deben comer durante el embarazo?  
\_\_\_\_\_  
    9a. ¿Por qué las mujeres nunca se deben comer estas comidas?  
    \_\_\_\_\_
10. ¿Cuál comidas son parte de antojos?  
\_\_\_\_\_
11. ¿Hay comidas que cree Ud. que son mejores para comer durante cuarentena y durante darle a pecho?  
\_\_\_\_\_  
    11a. ¿Por qué?  
    \_\_\_\_\_
12. ¿Hay algunas comidas que nunca se deben comer durante cuarentena y durante darle a pecho?  
\_\_\_\_\_  
    12a. ¿Por qué las mujeres nunca deben comer estas comidas?  
    \_\_\_\_\_

Survey: English

1. Sex: M F
2. Are you *tico*? Yes No
3. How long have you lived in Monteverde?  
    < 5 years                  6-10 years                  11-20 years                  >20 years  
    2a. If less than 20 years, where did you live before? \_\_\_\_\_
4. When is your date of birth? \_\_\_\_/\_\_\_\_/\_\_\_\_/
5. Where is your family from? \_\_\_\_\_
6. Do you have children? Y N  
    6a. If yes, how old are your children?  
    \_\_\_\_\_
7. Where do most women get information about the best foods for to eat during pregnancy/nursing?  
    \_\_\_\_\_
8. In your opinion, what are the best foods to eat during pregnancy?  
    \_\_\_\_\_  
    8a. Why?  
    \_\_\_\_\_
9. Are there foods that should never be eaten during pregnancy?  
    \_\_\_\_\_  
    9a. Why should women avoid these foods during pregnancy?  
    \_\_\_\_\_
10. Which foods are commonly craved during pregnancy?  
    \_\_\_\_\_
11. Are there foods that are good to eat during *cuarentena* and while breastfeeding?  
    \_\_\_\_\_  
    11a. Why?  
    \_\_\_\_\_
12. Are there foods that should never be eaten during *cuarentena* and while nursing?  
    \_\_\_\_\_  
    12a. Why should women avoid these foods?  
    \_\_\_\_\_

24-hour Diet Recall: Spanish

Recordatorio de Consumo en Últimas 24 Horas

ID \_\_\_\_\_

DATE \_\_\_\_\_

Hora	Comida	Porción	Preparación	Comentarios
La mañana				
La tarde				
La noche				

¿Es una representación de su dieta normal? Sí\_ No\_\_\_\_

Si no, ¿Por qué? \_\_\_\_\_

24-hour Diet Recall: English

ID\_\_\_\_\_

DATE\_\_\_\_\_

Is this representative of your usual diet? Yes\_\_\_\_\_

No\_\_\_\_\_

Hour	Food item	Amount	Preparation	Comments
Morning				
Afternoon				
Evening				

Is this a good representation of your daily diet? Yes\_\_\_\_\_

No\_\_\_\_\_

If not, why not?\_\_\_\_\_



## Focus Group Questions: Spanish

### Preguntas

#### Grupo de enfoque #1

#### Ejercicio de listado libre

1. ¿Cuáles comidas y bebidas consumen normalmente las mujeres durante el embarazo?
  - a. ¿Por qué las mujeres embarazadas comen o beben estas comidas o bebidas?
  - b. ¿Qué beneficios puede recibir una madre si come estas comidas o bebidas?
2. ¿Cuáles comidas y bebidas son mejores normalmente comer para la salud de la madre cuando da el pecho (dar de mamar)?
  - a. ¿Por qué las mujeres comen o beben éstas comidas cuando da el pecho?
  - b. ¿Cuáles beneficios recibe el bebé y la madre?
3. ¿Hay algunas comidas o bebidas que nunca se deben comer o beber durante el embarazo?
  - a. ¿Por qué hay comidas o bebidas que nunca se debe comer durante el embarazo?
4. ¿Hay algunas comidas y bebidas que nunca se deben comer y beber cuando da el pecho (dar de mamar)?
  - a. ¿Por qué hay algunas comidas y bebidas que nunca se deben comer y beber cuando dan el pecho?
5. ¿Ud. Ha tenido o tuvo antojos? Y que tipo de comidas? ¿Son algunas de las que mencionó antes?
  - a. ¿Qué le puede pasar a una mujer embarazada si no come estas comidas o bebidas?
6. ¿Cuáles cuidados son importantes durante la cuarentena?

- a. ¿Por qué?
- 7. ¿Ud. Recibió información especial sobre como alimentarse durante el embarazo?
  - a. Si, sí, ¿dónde, o quién le da información?

Grupo de enfoque #2

Ejercicio de escrito libre

1. ¿Veinte o treinta años pasados, cuáles comidas y bebidas probablemente fueron mejores para comer o para la salud de la madre cuando estuvieron embarazada?
  - a. ¿Por qué las mujeres embarazadas comieron o bebieron estas comidas o bebidas?
  - b. ¿Cuáles beneficios recibe el bebé y la madre?
2. ¿Veinte o treinta años pasados, cuáles comidas y bebidas probablemente fueron mejores para comer o para la salud de la madre cuando estuvieron dando a pecho?
  - a. ¿Por qué las mujeres dando a pecho comieron o bebieron estas comidas o bebidas?
  - b. ¿Cuáles beneficios recibe el bebé y la madre?
3. ¿Hay algunas comidas y bebidas que nunca se debieron comer y beber durante el embarazado?
  - a. ¿Por qué hay algunas comidas y bebidas que nunca se debieron comer y beber durante el embarazado?
4. ¿Hay algunas comidas y bebidas que nunca se debieron comer y beber durante el dando a pecho?
  - a. ¿Por qué hay algunas comidas y bebidas que nunca se debieron comer y beber durante el dando a pecho?
  - b. ¿Qué le puede pasar a una mujer embarazada si come éstas comidas?
5. ¿Ud. Hubo tenido antojos? ¿Y qué tipo de comidas? ¿Son algunas que mencionó antes?

- a. ¿Qué le puso pasar a una mujer embarazada si no come estas comidas o bebidas?
- 6. ¿ Cuáles cuidados son importantes durante la cuarentena?
- 7. ¿Ud. Recibió información especial sobre como alimentarse durante el embarazo?
  - a. Si, sí, ¿dónde, o quién le da información?

## Focus Group Questions: English

### Questions

#### Focus group #1

#### Free listing exercise

1. Which foods and beverages do pregnant women normally consume?
  - a. Why do pregnant women eat or drink these foods or beverages?
  - b. What are the benefits for the mother if she eats or drinks these foods or beverages?
2. Which foods and beverages are normally best for the mother while she is breastfeeding?
  - a. Why do women eat or drink these foods or beverages while they are breastfeeding?
  - b. What are the benefits to the mother and to the child?
3. Are there foods or beverages that women should avoid during pregnancy?
  - a. Why should these foods and beverages be avoided during pregnancy?
4. Are there foods and beverages that should be avoided while the mother is nursing?
  - a. Why should these foods and beverages be avoided while the mother is nursing?
5. Have you had food cravings during pregnancy? What type of foods? Are they some that have been previously mentioned?
  - a. What happens to a pregnant woman if she doesn't eat those foods or beverages?
6. What precautions are important during *cuarentena*?
  - a. Why?
7. Did you receive special information about nutrition during pregnancy?

- a. If yes, where or from you did you get this information?

## Focus group #2

### Ejercicio de escrito libre

1. Twenty or thirty years ago, when you were pregnant, which foods and beverages were probably best to eat or best for health during pregnancy?
  - a. Why did pregnant women eat or drink these foods or beverages?
  - b. What are the benefits to the mother and to the child?
2. Twenty or thirty years ago, when you were breastfeeding, which foods and beverages were probably best to consume or best for health while breastfeeding?
  - a. Why did nursing women eat or drink these foods or beverages?
  - b. What are the benefits to the mother and to the child?
3. Are there foods and beverages that should be avoided during pregnancy?
  - a. Why are these foods and beverages avoided during pregnancy?
4. Are there some foods and beverages that should be avoided while nursing?
  - a. Why are these foods and beverages avoided while nursing?
5. Have you had food cravings during pregnancy? What type of foods? Are they some that have been previously mentioned?
  - a. What happens to a pregnant woman if she doesn't eat those foods or beverages?
6. What precautions are important during *cuarentena*?
  - a. Why?
7. Did you receive special information about nutrition during pregnancy?
  - a. If yes, where or from you did you get this information?



Verbal Consent: Spanish

Hola, mi nombre es Allison Cantor. Yo estoy en mi último año universitario y estoy haciendo una investigación académica afiliada con el instituto de Monteverde. Estoy haciendo un estudio sobre las dietas de mujeres durante el embarazo y cuando darle el pecho. ¿Ud. le gustaría participar? Participantes necesitan tener al menos dieciocho años. ¿Tiene al menos dieciocho años? También participantes necesitan ser ticos. ¿Ud. es tico? No necesito más de diez minutos de su tiempo, ¿Estaría bien si incluyo su información en mi reportaje?

Verbal Consent: English

Hello, my name is Allison Cantoy. I am in my last year of University and I am doing an academic investigation affiliated with the Monteverde Institute. I am doing a study on women's diet during pregnancy and nursing. Would you like to participate? Participants must be at least 18 years old. Are you at least 18 years old? Also, participants need to be *tico*. Are you a *tico*? I will not need more than 10 minutes of your time. Would it be alright if I include your information in my report?



APPENDIX 2

IRB APPROVAL



**Social/Behavioral IRB – Expedited Review  
Approval Notice**

**NOTICE TO ALL RESEARCHERS:**

*Please be aware that a protocol violation (e.g., failure to submit a modification for any change) of an IRB approved protocol may result in mandatory remedial education, additional audits, re-consenting subjects, researcher probation suspension of any research protocol at issue, suspension of additional existing research protocols, invalidation of all research conducted under the research protocol at issue, and further appropriate consequences as determined by the IRB and the Institutional Officer.*

**DATE:**           , 2009

**TO:**            **Dr.**           ,

**FROM:** Office for the Protection of Research Subjects

**RE:**            Notification of IRB Action by Dr. J. Michael Stitt, Chair  
                  Protocol Title:  
                  Protocol #:

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This memorandum is notification that the project referenced above has been reviewed by the UNLV Social/Behavioral Institutional Review Board (IRB) as indicated in Federal regulatory statutes 45 CFR 46. The protocol has been reviewed and approved.

The protocol is approved for a period of one year from the date of IRB approval. The expiration date of this protocol is           , 2010. Work on the project may begin as soon as you receive written notification from the Office for the Protection of Research Subjects (OPRS).

**PLEASE NOTE:**

Attached to this approval notice is the **official Informed Consent/Assent (IC/IA) Form** for this study. The IC/IA contains an official approval stamp. Only copies of this official

IC/IA form may be used when obtaining consent. Please keep the original for your records.

Should there be *any* change to the protocol, it will be necessary to submit a **Modification Form** through OPRS. No changes may be made to the existing protocol until modifications have been approved by the IRB.

Should the use of human subjects described in this protocol continue beyond \_\_\_\_\_, 2010, it would be necessary to submit a **Continuing Review Request Form** *60 days* before the expiration date.

If you have questions or require any assistance, please contact the Office for the Protection of Research Subjects at [OPRSHumanSubjects@unlv.edu](mailto:OPRSHumanSubjects@unlv.edu) or call 895-2794.

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Potential Implications for the Developmental Origins of Obesity-Related  
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