Assessing Body Image, Body Dissatisfaction, and Dietary Acculturation Issues and Investigating Health and Diabetes Perceptions among Minnesotan Hmong American Children, 9-18 years

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Dedication

To my families in India and United States
Abstract

This study, one component of a larger research project, investigated body image ideals, health and diabetes perceptions, and dietary acculturation issues among Hmong American children, 9-18 years of age. To accomplish this, we assessed results from silhouette drawing instrument, focus groups data (conducted prior to this project by two trained researchers (Franzen & Smith, 2009a, 2009b, 2010)), a validated survey, anthropometric data, and 24-hour dietary recalls. Key findings showed that Hmong children are dissatisfied with their current body shape/size, and are probably at a risk for developing eating disorders now or in the near future. Environmental influences shaped children’s health and diabetes perceptions more than personal and/or behavioral factors. Dietary results indicated that Hmong diets are high in fats, oils, sweets, and sodium and low in dairy, whole grains, fruits, and vegetables. Further, children born in United States (US) consumed significantly more calories, carbohydrates, saturated fat, and sodium, and had a higher BMI-for-age than those who were born in Thailand/Laos. Given that Hmong are a growing Asian subgroup in the US, this research may help to provide useful insights and understandings on Hmong health perceptions, current health status, and body image ideals specifically from a cultural perspective. This may further help health educators, researchers, and community leaders in planning culturally sensitive educational interventions in this population.
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INTRODUCTION

Minorities form an important and growing segment of the United States (US) population. The US Census Bureau (2007a) reported that minority populations topped 100 million in 2007 and that one in three US residents is a minority. Asian Americans are one of the fastest growing minority populations in the US with a population rise of 3.2 percent or 460,000 between 2005 and 2006 (US Census Bureau, 2007a). Over 30 different ethnic subgroups comprise Asian Americans (Kawamura, 2002), and Hmong are one of the emerging Asian subgroups. Originally from Laos, Hmong assisted the US military and Central Intelligence Agency (CIA) during the Vietnamese Conflict (1963-1975) (Fadiman, 1997; Franzen & Smith, 2009a; Lee & Pfeifer, 2006).

After the US had pulled out of Southeast Asia, Hmong faced persecution in their home country of Laos from communists because of their help to the US. Post Vietnam-Conflict, communists targeted Hmong for genocide and Hmong suffered many hardships including poverty, starvation, and food insecurity (Franzen & Smith, 2009a; Her & Culhane-Pera, 2004; Johnson, 2002; Yang et al., 2009). It is believed that one-third of the Hmong population in Laos perished in the hands of communists during this time (United Hmong Association, NC). Many Hmong fled Laos and were granted refugee status in US and in refugee camps in Thailand (Lee & Pfeifer, 2006). The refugee camps in Thailand were usually overcrowded with little or no food and water; soon disease and starvation followed (Fadiman, 1997). Some Hmong refugees in the camps were given the opportunity to resettle in countries such as Australia, France, Canada, and the US (Johnson, 2002; Yang et al., 2009).
The Hmong have a traditionally rich cultural history. The culture is 4000 year old with values such as commitment, honor, freedom, and loyalty (Hamilton-Merritt, 1993). There are about 18 different Hmong clans or family groups, and members of a clan share the same last name (Lee & Pfeifer, 2006). Members from the same clan are also expected to provide social, financial, and medical assistance to each other when needed and marriage within the same clan is not culturally acceptable (Centers for Disease Control and Prevention (CDC), 2008a; Fadiman, 1997; Lee & Pfeifer, 2006). Traditional Hmong families are patriarchal and the oldest male is considered to be most knowledgeable, making important familial decisions and performing most religious, ancestral, and funeral rituals (CDC, 2008a; Lee & Pfeifer, 2006). Traditionally, Hmong women had limited liberties in making decisions and their duties included doing household chores, raising children (especially boys), and parenting. Hmong usually have a larger family size with about 9-14 people living in one household, often nuclear and extended families live together (CDC, 2008a).

Traditional Hmong views regarding health and beauty differ from the American standards of beauty and attractiveness. Most Western cultures associate a thinner body size with beauty, attractiveness, and success, specifically among girls and women (Cash & Pruzinsky, 2002; Grogan, 2008). However, cultures where food supply is/was scarce tend to associate a larger body size with health, wealth, beauty, food security, and even survival (Franzen & Smith, 2009a; Striegel-Moore & Franko, 2002). Unlike the Western notion, where thinness is related with being beautiful, traditionally, Hmong have associated a larger, rounded body shape with beauty, wealth, and fertility (Franzen & Smith 2009a, Yang & Mills, 2008).
Post-migration to the US and adaptation to American social norms might influence traditional Hmong views regarding health, diet, and body image perceptions, especially in the younger Hmong generation. Given that the Hmong are a growing Asian American subgroup, it is important to know this population’s health beliefs, current dietary status, and body image perceptions from a health care perspective. Therefore, the purpose of the present research was to: a) investigate body image perceptions and body satisfaction/dissatisfaction issues, b) assess perceptions regarding health and diabetes risk, and c) investigate whether time lived in the US, acculturation, and birth location influences the dietary quality of immigrant Hmong population, specifically from a cultural perspective.

To meet these research objectives, this project integrated both qualitative (phase I data, collected prior to this project) and quantitative (phase II data, collected during this project) methodologies. This project is a component of a larger data set (Franzen & Smith 2009a, 2009b, 2010), and phase I involving focus groups was completed prior to the start of the current project. Two trained researchers (Franzen & Smith 2009a, 2009b, 2010) conducted twelve focus groups with Hmong children \( N = 68 \) 9-18 years in Minneapolis/Saint Paul, Minnesota (MN). The current project integrated body image results obtained through focus groups (phase I) to complement the quantitative data collected during phase II of the project. Using formative data, Franzen and Smith developed a survey instrument using Bandura’s Social Cognitive Theory (SCT) as the theoretical framework and the survey was pre-tested among 35 Hmong children prior to the second phase of this project. During phase II, survey data, body image assessment (through silhouette drawing instrument), two dietary assessments (two 24-hour recalls...
and Kids Block Food Frequency Questionnaire), and anthropometric measurements (height and weight for the current project) were collected.

The following literature review examines the influence of acculturation on dietary habits and behavior, the rising rates of obesity and diabetes, and body image perceptions and ideals among Hmong population. Further, the use of Social Cognitive Theory (SCT) in research design has also been reviewed. The literature review is followed with research questions addressed within the project, and an overview of methodology and study design. The results obtained through our investigation are presented as manuscripts submitted for publication. One manuscript has been published, another has been accepted for publication and currently is in press (available on-line), while one is under second review (revised form submitted). Lastly, the thesis will conclude with a concise summary of results and future implications based on the results of our investigation.
CHAPTER 1

Literature Review
LITERATURE REVIEW

Who Are The Hmong?

The Hmong are one of the Asian American ethnic subgroups living in the United States (US). Originally a hill tribe, the Hmong inhabited Southern China, and over time migrated to the mountainous regions of Laos, Northern Vietnam, and Thailand to resist the political turmoil from the Han Chinese during 1790-1860 AD (Centers for Disease Control and Prevention (CDC), 2008a; Fadiman, 1997; Johnson, 2002; Lee & Pfeifer, 2006). The word ‘Hmong’ holds the connotations of ‘free people’ or ‘those who must have their freedom and independence’ (Hamilton-Merritt, 1993). Most Hmong in the US are from Northern Laos, and today about 300,000 Hmong reside in Laos (CDC, 2008a).

Traditionally, Hmong lived in mountainous regions of Laos and practiced agriculture for their livelihood. The Hmong have a collectivistic culture, where the decision of the group is valued more than an individual’s choice (CDC, 2008a). Hmong have 18 different clans or family groups, and members from the same clan share the same last name such as Yang, Her, Moua, and Thao (Fadiman, 1997; Lee & Pfeifer, 2006). Clan members are believed to be socially bonded and seek each other for advice, counsel, and social, medical, and financial support (CDC, 2008a; Fadiman, 1997; Lee & Pfeifer, 2006). Membership to the clan is obtained by birth, adoption, or through marriage, when a woman adopts her husband’s clan name. Today, many married Hmong women in the US identify themselves both by their birth and husband’s clan name by hyphenating both last names (CDC, 2008a).

The Hmong speak one of the two dialects of the Miao-Yao language: White Hmong (Hmong Der dialect) and Green Hmong (Mong Leng dialect). In the US, about
60% of the Hmong speak White Hmong and 40% speak the Green Hmong (CDC, 2008a). In Laos, the White Hmong language is preferred over Green Hmong language and the former is used in most educational and research materials and spoken by younger generation (CDC, 2008a). It is known that the Hmong had lost their written language for centuries until the 1950s when the French missionary invented one for Hmong (United Hmong Association, NC). Today, Hmong have two forms of written language: ‘Hmong Latin’, which uses English alphabets and is the widely known form of written Hmong and the less popular ‘Hmong Pa Hoh’ (United Hmong Association, NC).

The traditional Hmong families are patriarchal in nature, and a man is usually the head of the household. Family size may vary from 9 to 14 people per household with members from nuclear and extended families often living together (CDC, 2008a). Important familial decisions are made by the eldest son in the household, who also performs important religious and ancestral rituals and prayers. Traditionally, sons inherited most of the wealth from the family and were the ones to receive an education (United Hmong Association, NC). Traditional Hmong women had limited liberties in making familial decisions and their duties included preparing meals, doing domestic chores, rearing children, and sometimes managing finances (CDC, 2008a; Fadiman, 1997; United Hmong Association, NC). Further, the status of a Hmong woman improved after giving birth to a son, as the son would later carry the family name and his wife would help with household tasks. Early marriage was seen as a benefit for the family and community and was mostly observed among females (CDC, 2008a). Even today, it is believed that majority of the Hmong females are married between the ages of 13 to 23 years, and most are married by the age of 16 (CDC, 2008a).
An important part of the Hmong history is their aid to the US in the Vietnam War. During the Vietnam War (1963-1975), Hmong assisted the US army and Central Intelligence Agency (CIA) in a secret cooperative relationship against the communists in Laos (Fadiman, 1997; Hamilton-Merritt, 1993; Lee & Pfeifer, 2006). William Coldy, the then Director of the CIA credited the Hmong for blocking the entry of communists for several years and therefore saving the lives of thousands of US soldiers (Lee & Pfeifer, 2006). However, it is believed that the Hmong cooperation during the Vietnam War was not officially acknowledged by the US officials and CIA until the 1980s (Lee & Pfeifer, 2006). It is estimated that about 30,000-40,000 Hmong soldiers lost their lives during the Vietnam War (Hamilton-Merritt, 1993; Lee & Pfeifer, 2006).

Hmong immigration

The Hmong population suffered many hardships before immigrating to the US. Post-Vietnam Conflict beginning in 1975, thousands of Hmong fled Laos after being targeted for genocide from the communists, during which many Hmong lost their lives (Lee & Pfeifer, 2006). Hmong were discriminated by communists in their own home country of Laos and often suffered hardships such as excessive labor, poverty, food insecurity, depression, and anxiety (Fadiman, 1997; Franzen & Smith, 2009a, Hamilton-Merritt, 1993). Yang (2001) suggests that about 10% of the Laos population fled to countries such as Thailand, France, Australia, and the US. It is believed that the first wave of Hmong refugees arrived to the US from Thailand camps in December 1975 (Hamilton-Merritt, 1993). About 750 Hmong were admitted to the US in early 1976, and 1980 was the peak year of Hmong immigration in the US when 27,000 Hmong entered the US (Yang, 2001). In 1990, about 94,439 Hmong were counted in the US, and this
number grew to 186,310 in the year of 2000, representing a 97% population increase over the decade (Hmong National Development; Hmong Cultural and Resource Center). The Hmong American population has grown ever since, and about 200,000 Hmong currently live in the US, and Minnesota, Wisconsin, Michigan, North Carolina, and California are some of the states with a high Hmong population (Lee & Pfeifer, 2006; US Census Bureau, 2007b). However, the Hmong population is significantly underestimated in the US Census because not all Hmong completed the Census information (Lee & Pfeifer, 2006; Hmong National Development; Hmong Cultural and Resource Center). It is believed that language barrier while filling the Census form and fear of information disclosure resulted in many Hmong not being counted in the Census (Lee & Pfeifer, 2006). Over 70,000 Hmong live in Minnesota (MN) and Saint Paul, MN has the largest Hmong population within the state with over 24,000 Hmong (Lee & Pfeifer, 2006).

**Hmong in America**

The Hmong are an emerging Asian American ethnic subgroup. Among all Asian Americans, Hmong represent the youngest Asians with a mean age of 13 years, and have the largest family size with an average of 6.6 people per household (Yang, 2001). About 50% of adult Hmong Americans have less than 9th grade education and 40% have a high school diploma. However, the number of Hmong earning a high school diploma and a Bachelor’s degree has more than doubled since 1990, indicating considerable educational progress (Lee & Pfeifer, 2006). Although Hmong men still have more education than Hmong women, the educational gap between the genders is gradually narrowing and more Hmong women are now competing with men for higher education, career, and financial responsibilities (Lee & Pfeifer, 2006).
About 70% of Hmong Americans practice traditional Hmong religion incorporating animism, the belief that all elements of the earth and its creatures possess spirits or souls that live in harmony when they know that each is living with respect and honor for each other (Kim et al., 2007; Lee & Pfeifer, 2006). The traditional Hmong religion believes that the spirits, including the ancestral spirits need to be satisfied through regular ritualistic animal sacrifices (Johnson, 2002; Lee & Pfeifer, 2006; Yang, 2001). While most Hmong Americans still practice traditional religion, one-third practice Christianity (Lee & Pfeifer, 2006). It is important to respect religious beliefs and values while treating a Hmong American patient as religion, health beliefs, and medicine intertwine in this culture and many Hmong still adhere to the traditional concepts regarding illness, disease, and treatment (Hmong National Development; Hmong Cultural and Resource Center; Johnson, 2002; Lee & Pfeifer, 2006).

**Hmong Diets: Past and Current**

Similar to most immigrant groups, the US environment has influenced Hmong dietary and food related habits, and traditional Hmong diets may be changing in this group with the increasing number of years spent in the US. Traditionally in Laos, Hmong consumed a diet rich in complex carbohydrates and low in refined sugars (Franzen & Smith, 2009a; Goody & Drago, 2010). Rice was consumed 2 to 3 times a day and often contributed to half of a person’s daily energy requirement (Goody & Drago, 2010). Further, boiled vegetables including bamboo shoots, melon, squash, beans, and mustard greens were often consumed (Goody & Drago, 2010). Starchy vegetables included cassava, plantains, and pumpkin. Among meats, chicken, pork, fish, and beef were consumed. Seasonal fruits included jackfruit, mango, guava, apple-pear, and papaya.
Seasonings were minimal and included lemongrass, garlic, ginger, chili peppers, and fish sauce (Culhane-Pera & Xiong, 2003; Franzen & Smith, 2009a). A traditionally cooked meal was usually bland in taste, and salt was sparingly used (Franzen & Smith, 2009a). Dessert items were not typical of a traditional Hmong diet and snacking was seldom done because of food shortages (Franzen & Smith, 2009a). In addition, carbonated beverages and sweet juices were not consumed and water and vegetable broth were the usual beverage choices in Laos (Goody & Drago, 2010).

After immigrating to the US, it appears that Hmong dietary habits and food related practices have shifted to a Western one. An increased consumption of saturated fats, refined grains, salt, and sugar has been noted (Franzen & Smith, 2009a; Goody & Drago, 2010). Fruit and vegetable consumption has decreased, and foods are usually stir/deep fried rather than boiled or steamed as traditionally. Further, soft drinks and colas have replaced the traditional vegetable broths, specifically among children (Franzen & Smith, 2009a). Additionally, desserts such as cookies, cakes, pies, and ice-creams which were not heard of in Laos are now commonly consumed in the Hmong American diet (Goody & Drago, 2010). Further, the younger Hmong American generation is consuming more American foods including pizza, hamburger, fries, hot dogs, spaghetti, tacos, and soft drinks (Franzen & Smith, 2009b, Goody & Drago, 2010; Yang & Mills, 2008).

A history of food insecurity in Laos also influenced Hmong post-migration eating behavior and habits. Post-migration, Hmong are more food secure and have the financial capability to afford more food than they could in Thailand/Laos. However, the process of adapting to American diets has resulted in making poorer food choices in this group. Research suggests that easy availability of high fat foods, accessibility to federal food
assistance programs in the US, and financial security to buy foods contributes to an increased consumption of calories among Hmong population (Franzen & Smith, 2009a, 2009b; Yang & Mills, 2008). Among Californian Hmong, Yang and Mills (2008) found a higher consumption of saturated fats and sugars and low fruits and vegetables consumption, partly because of urbanization, and convenience foods being preferred more than the traditional food choices.

**Hmong Acculturation and Dietary Transition**

Immigrating to a new culture can result in changes in an individual’s attitudes, beliefs, and values. Acculturation is defined as the process of adaptation to a new culture during which individuals modify certain aspects of their values, norms, and behavior--including dietary behaviors in response to contact between two cultures (Dave et al., 2009). Although acculturation can result in changes in either host or immigrant group, usually the effects of acculturation are more profound in the immigrant group (Berry, 1997). Research has suggested that acculturation to US dietary habits and eating behaviors such as increased consumption of fats, sugars, and refined products has resulted in overweight/obesity among the immigrant populations (Franzen & Smith, 2009a, 2009b, 2010; Gordon-Larson et al., 2003; Harrison et al., 2004; Himmelgreen et al., 2004). Among low-income Puerto Rican women, Himmelgreen et al (2004) found that BMI increases were associated with length of time spent in the US and women who were in the US for 10 or more years were more likely to be obese than the recently immigrated ones. Among Hmong adults in Minnesota, Franzen and Smith (2009a) found that the length of time staying in the US was positively associated with dietary
Hmong Activity: Past and Current

Acculturating to the US norms and habits seems to have influenced traditional Hmong perceptions regarding physical activity. Traditionally, most Hmong were agrarian in nature and worked hard in the fields throughout the day (Franzen & Smith, 2009a; Goody & Drago, 2010). After immigrating to the US, some Hmong continue farming, but most are working with sedentary jobs and have busier lifestyles which allow little or no time for exercising (Culhane-Pera & Xiong, 2003; Yang & Mills, 2008). The effects of physical inactivity can also be found among younger Hmong. Stang et al (2007) reported that when compared with white adolescents, Hmong adolescents reported less physical activity and were at an increased risk for obesity. Additionally, CDC (2007) indicates that in general, Asian Americans exercise less when compared with the general population, possibly contributing to the increasing trends in obesity among this population.

From a cultural perspective for Hmong, the concept of exercising for leisure is a foreign idea. Most Hmong associate physical activity with occupation; having worked in the fields and thriving on agriculture in their home country of Laos (Franzen & Smith, 2009a). Post-migration, Hmong acculturate to US norms, and urbanization, sedentary habits, and lack of time, money, and space to be physically active negatively influences their health status (Kim et al., 2007). Goody & Drago (2010) suggest that some Hmong might be reluctant to be physically active to lose weight because losing weight is considered as a negative health condition in traditional Hmong culture. Therefore nutrition counselors should aim to educate Hmong patients about the benefits of losing
excess weight while incorporating culturally appropriate physical activities such as
gardening and walking (Goody & Drago, 2010).

**Health Beliefs Among Hmong: Past and Current**

Traditional health beliefs among Hmong incorporate a holistic approach, where a
person’s mind, soul, and physical body should be in harmony with the spirit world in
order to be disease free. Traditionally, Hmong believe that illness is caused by imbalance
in the following realms (Fadiman, 1997; Her & Culhane-Pera, 2004; Johnson, 2002; Lee
& Pfeifer, 2006):

*Natural:* Illnesses in the natural realm occur because of the surrounding
environment and natural causes such as aging. Such illnesses may occur because of
germs, spoiled foods, imbalance of hot and/or cold foods, and changes in weather.
Natural illnesses are treated through herbal medicines, massages, special diet, and
magical healing (Fadiman, 1997; Lee & Pfeifer, 2006).

*Supernatural:* Such illnesses occur when a person’s soul is stolen by evil spirits,
the soul is frightened out of the body, or the ancestral spirit is upset. Illnesses caused
because of ancestral anger are believed to be less severe, occurring when the ancestors
are offended, and could be resolved by offering sacrifices to the ancestral spirits through
ritualistic ceremonies (Fadiman, 1997; Johnson, 2002). Supernatural illnesses may also
be treated with soul calling (when evil spirits steal a person’s soul), calming the angry
spirits, and rituals administered by a Shaman, who mediates the communication between
the physical and spiritual world (Her & Culhane-Pera, 2004; Johnson, 2002).

*Social:* Illnesses occur in the social realm because of stressful situations, fighting,
and cursing. Traditional Hmong culture believes that a person may curse the wrongdoer
and bring upon illness and disease (Fadiman, 1997; Lee & Pfeifer, 2006). Such illnesses are treated by either incorporating natural and supernatural ways of treatments or having specific ‘forgiveness ceremonies’ aimed towards repenting the sins and asking for forgiveness from an individual (Fadiman, 1997; Her & Culhane-Pera, 2004).

Clearly, traditional Hmong believe that illness may be caused by a variety of reasons and the etiology of illness and disease among Hmong is different than the American perspective which follows the biomedical views. Biomedicine believes that scientific rationality is important, and therefore any suggested hypothesis is tested and verified under objective and empirical conditions (Johnson, 2002). However, many Hmong mistrust the American medical system, often believing that the American medicines are stronger for their comparatively smaller body sizes, and even report being sick after consuming American medications (Goody & Drago, 2010). Most Hmong opt for remedy against their illness only when they are seriously ill, which by Western standards might be very late to intervene medically (Fadiman, 1997; Goody & Drago, 2010).

Lack of communication because of language barriers and cultural differences regarding health and treatment of illness often results in a lack of adherence and/or refusal to comply with the Western biomedicine. Johnson (2002) investigated health beliefs among Californian Hmong population and found that differences between traditional Hmong medicinal beliefs and Western biomedicine resulted in mistrust and fear of Western medicine among Hmong adults and some patients even reported being mistreated in American hospitals. Further, while conducting focus group interviews with type-2 diabetic Hmong American women, Yang et al (2009) found that the women were
depressed and felt isolated in the Western health care environment because of their inability to speak, read, and write English language.

In a health care setting, a cultural understanding regarding disease and illness and respect towards traditional health beliefs is important to gain the trust of a patient. Her and Culhane-Pera (2004) suggest that while dealing with a Hmong American patient, health care providers should incorporate culturally sensitive ways such as incorporating trained interpreters, being patient and kind while communicating, listening to the patient’s perspective and reaction to biomedicine, acknowledging differences and similarities between Hmong and American treatment methods, and accommodating patient’s cultural and family values. Further, cultural respect, kindness, and open communication with Hmong patients may help in educating this group about the importance of screening, specifically for common diseases such as diabetes and cancer in this population (Lee & Vang, 2010).

Today, Hmong may opt for both traditional and Western approaches to healing, depending upon the nature and elapsed time in sickness. A health survey conducted in Orange County, California found that about three-fourths of Hmong went to a Shaman when sick (Goody & Drago, 2010). Some Western physicians believe that traditional approaches to healing such as consulting a Shaman might help traditional Hmong in coping with anxiety, depression, and other mental disorders (Goody & Drago, 2010). Further, medicinal herbs used in traditional Hmong therapy are believed to be rich sources of iron, calcium, and zinc. The second and third generation Hmong who are more acculturated to American health care system seem more comfortable with the Western biomedicine than the recently immigrated ones (Fadiman, 1997; Goody & Drago, 2010).
Current Health Issues: Obesity and Diabetes

Obesity is a serious public health concern, and rates of overweight and obesity are rising in the US, specifically among children and adolescents. Results from 2007-2008 National Health and Nutrition Examination Survey (NHANES) using measured heights and weights indicate that an estimated 17% of children and adolescents ages 2-19 years were obese (BMI-for-age at or above 95th percentile) and about 12% had BMI-for-age at or above the 97th percentile (Ogden et al., 2010). Further, obese children are more likely to become obese adults. Whitaker et al (1997) found that approximately 80% of children who were overweight at ages 10–15 years were obese adults at 25 years of age. Obese children and adolescents are at risk for developing negative health conditions such as cardiovascular diseases, hypertension, type-2 diabetes, and certain kinds of cancers (Ogden et al., 2010). Currently, 40% of the US children aged five to eight have at least one risk factor for heart disease (CDC, 2007). Obesity also decreases the quality of life, decreases life span, and increases health care costs; average annual medical expenditures are $732 higher for an obese individual compared with a healthy weight individual (Bhattacharya & Bundorf, 2009; CDC, 2009). It is also estimated that almost 10% of the medical spending is attributed to obesity and the medical costs of obesity may have risen to $147 billion per year by 2008 (Finkelstein et al., 2009).

Obesity among Asian Americans is also on the rise, and acculturation to US dietary norms probably increases the prevalence of obesity among this group. The prevalence of overweight among Asian and Pacific Islander children in California increased from 7% to 15% between the years 1994-2003 (Medical News Today, 2004). Additionally, Asian American adolescents born in the US to immigrant parents are more
than twice as likely to be overweight compared with foreign born adolescents (CDC, 2007). Among Hmong, in a sample of Hmong refugees (N = 448, ages >20 years), Culhane-Pera et al (2009) found that 33% of the sample was overweight and 15% were obese.

Along with obesity, diabetes poses a threat to the health and lives of many individuals. Once considered a disease of the West, the incidence and prevalence of diabetes has increased around the world, specifically among the developing countries. The International Diabetes Federation points that the number of individuals with diabetes will increase from 240 million in 2007 to 380 million in 2025 and more than 60% of those affected will be from Asia (Chan et al., 2009). Among Asian/Pacific Islanders younger than 20 years of age, CDC (2008b) further estimates that the rate of obesity dependent type-2 diabetes is greater than those for type-1 diabetes. After analyzing data from the 2001 Behavioral Risk Factor Surveillance System (BRFSS), McNeely and Boyko (2004) found the prevalence of diabetes among Asian Americans 60% higher compared with non-Hispanic White Americans.

Knowledge and education about obesity and diabetes risk factors is specifically important among Asian youth because of a higher susceptibility of this group to getting diabetes. Chan and colleagues (2009) indicated the ‘metabolically obese’ phenotype among Asians, meaning that a normal body weight but high susceptibility to insulin resistance and/or abdominal obesity suggest that the risk for type-2 diabetes starts at a lower BMI among this group. It is therefore important to educate Asian Americans about the risks associated with diabetes such as myocardial infarction, stroke, renal failure, blindness, and neuropathy, preferably from a younger age. An increase in diabetes and
obesity among Asian American population also calls into attention culturally sensitive programs and interventions aimed towards incorporating healthier lifestyle and increasing physical activity among Hmong.

**Body Image**

Body image is a multidimensional and complex phenomenon that includes perceptions, attitudes, beliefs, and cognition regarding our bodies. Factors such as culture, interpersonal experiences, physical characteristics, and personality contribute to the development of an individual’s body image (Cash, 2002). Adolescence is a crucial time for body image development as puberty, emerging sexuality, and gender roles significantly shape one’s body image perceptions (Levine & Smolak, 2002).

Body image concerns develop early in life, and adolescent/adult body image disorders could be traced to body image issues during childhood. Extreme concern or obsession with body size/shape has been identified as one of the strongest risk factors for the development of eating disorders in children and adolescents (Williamson et al., 2002). Negative body image may be referred to dissatisfaction with body weight, weight sensitive sites such as stomach, thighs, hips, or dissatisfaction with other physical characteristics such as facial features, hair, and skin color (Cash, 2002; Foster & Matz, 2002). Research suggests that by early adolescence, negative body image predicts the development of depression and eating disorders (Smolak, 2002). Further, negative body image is also associated with dieting, low self-esteem, anxiety, and obsessive-compulsive tendencies (Cash, 2002; Smolak, 2002; Verplanken & Velsvik, 2008). Dieting has been shown to contribute to increases in adiposity and obesity because of binge eating, making body image concerns and negative body image a possible contributor to overweight and
obesity (Striegel-Moore & Franko, 2002). According to Williamson et al (2002), people who are most susceptible to develop body image disorders have one or more of the following characteristics: a) fear of fatness, b) over concern with body size/shape, c) internalization of thin ideal body size/shape, and d) desire for a perfect body or obsession with their appearance.

**Gender and body image**

Body image issues among males and females may differ. In general it is known that females idealize a thinner body, while males may idealize a lean and/or muscular body among themselves (Cash, 2002; Grogan, 2008). However, research suggests that regardless of age, females are more likely to experience body image concerns compared with males (Grogan, 2008; Pope et al., 2000; Striegel-Moore & Franko, 2002). Body image concerns among girls and women usually include self-weight dissatisfaction; 95% of the females have dieted at some point in their lives (Ussher, 2000). Additionally, four out of five adolescent girls diet at least once during their teenage years and up to two-thirds of teenage girls are ‘on a diet’ at any given time, even though most of these girls are not overweight/obese (Striegel-Moore & Franko, 2002).

Earlier investigation on body image issues and body dissatisfaction has focused on females because preoccupation with body weight and fear of fatness were image issues believed to be encountered by this gender. However, recent research indicates that males are equally prone to develop body image issues and many fear gaining weight, sometimes undergoing excessive dieting, caloric restriction, and purging to confirm to a thinner body ideal (Grogan & Richards, 2002; Pope et al., 2000). Pope et al (2000) point that most men who suffer from body image disorders are not open to communicate and
hide such issues because worrying about one’s appearance and body size/shape are generally considered women’s problems. Media and social comparisons based on appearance are believed to be responsible for increasing body image issues among boys and men, including excessive exercise to build muscles but being fearful of gaining weight at the same time, resulting in an unrealistic body ideal of muscular yet lean body (Grogan, 2008; Pope et al., 2000). Body dissatisfaction among boys may result in potentially harmful situations including body dysmorphic disorder (preoccupation with perceived flaws), possible use of anabolic steroids, depression, anxiety, low self-esteem, and obesity (Olivardia et al., 2004; Pope et al., 2000).

**Culture and body image**

Body image perceptions and the definition of beauty, attractiveness, and acceptable body size/shape differ within and between cultural groups. While Western cultures tend to associate thinness with beauty, cultures where food supplies are or were scarce tend to associate a larger body size with health, wealth, beauty, and even fertility (Etcoff, 1999; Franzen & Smith, 2009a). During focus group interviews, Franzen and Smith (2009a) found that Hmong adults associated a heavier body size with survival and cultural emphasis on being plump created intergenerational conflict as the younger Hmong generation tried to balance the traditional body image views with the new American body image ideals. With immigration to the West and mass media’s influence, the traditional heavier beauty ideal in some cultures has transformed to fit a more Western beauty ideal (Becker, 2004; Striegel-Moore & Franko, 2002). In a sample of Fijian school girls, Becker et al (2002) found indicators of disordered eating behavior among girls after their exposure to thin body shapes in television, indicating the influence
of Western media in a culture where heavier body sizes are preferred. Further, Stang et al (2007) found higher levels of weight concern, body dissatisfaction, dieting, and unhealthful weight-control behaviors among Hmong adolescents when compared with white adolescents, probably indicating body image issues among Hmong who are trying to confirm to the American cultural norms of beauty and attractiveness.

**Body image development in children aged 11 years and under**

Body image concerns start early in life and the age at which children are believed to be dissatisfied with their bodies and appearance seems to be decreasing. Smolak (2002) indicates that body image concerns among children may start as early as age six, while Striegel-Moore and Franko (2002) believe that stigmatization of obesity can be seen in children as young as three years of age and children associate a heavier body size with laziness, ridicule, and find obese children as undesirable playmates (Etcoff, 1999; Grogan, 2008; Latner & Stunkard, 2003). About 40% of the elementary school girls and 25% of the elementary school boys are dissatisfied with their current body size and want to be thinner (Smolak, 2002). In Western cultures, thinness/leanness is associated with attractiveness, success, power, social acceptance, and a higher social status (Etcoff, 1999; Grogan & Wainwright, 1996; Pope et al., 2000). Furthermore, most children in today’s society are aware of negative behaviors and attitudes targeted towards the obese (Himes & Thompson, 2007; Latner & Stunkard, 2003). Birch and Fisher (1998) found that by age 7, children see an obese person as being less attractive, having fewer friends, and being less smart than a leaner person.

Children and adolescents undergo excessive measures including caloric restriction to confirm to the thin body ideal. Research has indicated that behaviors such as dieting,
fasting, excessive exercising, binging, and purging are common among children to attain a thinner body (Birch & Fisher, 1998; Fisher, 2006). Such behaviors have been identified as risk factors for developing eating disorders, poor self-esteem, depression, and obesity among children (Birch & Fisher, 1998; Neumark-Sztainer et al., 2006). In a longitudinal study ($N = 2516$), Neumark-Sztainer and colleagues (2006) found that children who dieted at a younger age were at an increased risk for excessive weight gain, disordered eating, and eating disorders five years later. Further, excessive caloric restriction can adversely affect a person’s psychological, emotional, and physical well being and also decrease one’s quality of life (Striegel-Moore & Franko, 2002).

Young children have body image ideals similar to their adolescent/youth counterparts, which is usually thinness among girls and muscularity among boys. If given a free choice, girls as young as 5 years of age choose a thinner body ideal for themselves compared to their perceived current body size (Grogan, 2008). Likewise, younger boys idealize muscular bodies among themselves and are drawn to illegal drugs and steroids to confirm to this unrealistic muscular but leaner body shape (Pope et al., 2000).

Sociocultural influences such as parents, peers, and media play an important role in the development of a child’s body and appearance image. Parents can influence their child’s body image in a number of ways. Negatively commenting and/or criticizing about their child’s appearance, weight, clothing, and eating habits influences the child’s body and self-esteem (Smolak, 2002). Further, some parents could be restrictive about what and how much their children eat, encouraging them to lose weight (Smolak, 2002). Parental restriction or control over their child’s intake of certain foods over others may inversely result in children liking these foods (Birch & Fisher, 1998). However, parental
modeling is an important influence, and positive parental role modeling could educate children about healthy food choices, media literacy, achieving optimum and healthy weight, and on developing a positive body image.

Peers also influence body image development, although peer influence is more profound among older children than younger ones. Peers may influence body image by setting standards of ‘acceptable body shape/size’ and socially comparing one’s body with the ideal shape. Peer influences contribute to the negative stereotypes associated with excess body weight among young children and therefore peers should be involved towards the development of positive body image from an early age (Smolak, 2002).

Apart from peers, media also shapes body image among young children. Children and teenagers view about 4400 –7600 ads per year for junk food and fast food on television alone (Strasburger et al., 2010). Television viewing influences children’s food beliefs and preferences, satiety cues are suppressed while eating and watching television and physical activity also decreases (Strasburger et al., 2010). By ages 8-11, girls may start reading the teen magazine that presents an ‘appearance ideal’ and also addresses appearance concerns. Up to half of these girls may read these magazines at least occasionally, with about 25% reading them twice a week (Smolak, 2002). The use of media to obtain weight and beauty information has been related to body image issues such as preoccupation with weight, body dissatisfaction, and eating disorder symptoms (Tiggemann, 2005), and therefore parents should be aware of the content of the media watched by their children on a regular basis.

Parents, peers, and media play an important role in body image development among younger children. Therefore, positive parental role modeling, media literacy, and
knowledge of realistic body image ideals are important for healthy body image development among young children.

**Body image development in adolescence**

Body image is an important aspect of psychological and interpersonal development in adolescence. During adolescence, normative developmental challenges such as puberty, emerging sexuality, and gender roles strongly influence or are influenced by one’s body image (Levine & Smolak, 2002). Body dissatisfaction is a potent risk factor for lowered self-esteem and disordered eating behavior among adolescents.

Pubertal developments during adolescence shape body image perceptions. Among girls, puberty is accompanied by an average weight gain of about 50 pounds, including 20-30 pounds of fat deposition in the hips, thighs, buttocks, and waist (Levine & Smolak, 2002). These developmental challenges result in dieting, drive for thinness, and negative body image among girls, making them more susceptible to body image challenges than boys (Levine & Smolak, 2002).

Some of the factors influencing body image perceptions among adolescents are similar to image influences among younger children, including mass media, peers, and family. Media’s influence is profound in shaping body image ideals among adolescence and young women often point to thin fashion models as their source of ‘pressure’ to be thin (Dittmar et al., 2009; Grogan, 2008; Smolak, 2004). It is believed that fashion models are thinner than 98% of the US women. Such comparison often results in anger, frustration, weight anxiety, depressed/negative mood, and insecurity about weight (Grogan, 2008; Smolak, 2004). Further, research suggests that exposure time to television
viewing and magazine reading is linked with eating disorder symptoms among women (Dittmar et al., 2009; Grogan, 2008; Smolak, 2004).

Among men, muscular and lean bodies portrayed by the media influence their body image perceptions and often lead to negative social comparison and body dissatisfaction. In a multiethnic sample of undergraduate males ($N = 158$), Agliata and Tantleff-Dunn (2004) observed that an exposure to TV commercials showing lean, muscular, and athletic models resulted in depression symptoms and muscle dissatisfaction among the participants. Media’s negative influence may lead to steroid use, excessive exercise, lowered self-esteem, and eating disorders among men (Grogan, 2008; Pope et al., 2000). Further, to ‘address’ negative male body image issues, advertising industry is booming with products such as food supplements, diet ads, fitness programs, and hair-growth remedies (Pope et al., 2000).

Peer influences regarding body image are more profound during adolescence than during childhood years. Negative verbal commentary regarding appearance and weight predicts body dissatisfaction issues among adolescents (Grogan, 2008; Levine & Smolak, 2002; Shroff & Thompson, 2006). Teasing from peers regarding one’s body weight and appearance may lead to body dissatisfaction and lowered self-esteem. At the same time, positive peer influences such as anti-binging/anti-purging advice and setting realistic image goals may help raise self-esteem and also decrease the possibility of eating disorders among children and adolescents (Shroff & Thompson, 2006).

Familial influences including parents and siblings also shape body image perceptions among adolescents. Adolescent girls are more likely to be teased about their body weight by their family members compared with boys, and girls who are conscious
of their body are more likely to be influenced by negative commentaries regarding their weight and/or appearance (Grogan, 2008; Levine & Smolak, 2002). Teasing and negative verbal commentary regarding weight and appearance results in short and/or long term body image issues including eating disorders, low self-esteem, low confidence level, and depression among adolescents, and could also lead to future image issues during adulthood (Levine & Smolak, 2002).

**Hmong body image perceptions and body ideals**

Research concerning body image is lacking in Asian Americans, specifically among the Hmong. Previously, researchers have studied Hmong dietary and food related behaviors, growth, and body esteem issues (Clarkin, 2008; Franzen & Smith, 2009a, 2009b; Franzoi & Chang, 2002; Stang et al., 2007), however, none has investigated factors influencing body image perceptions, ideals, and traditional cultural norms of beauty in the first and second generation Hmong migrants, especially from a cultural perspective. Hall (1995) argues that Asian Americans are referred to as the ‘model minority group’ and researchers earlier believed that a smaller body frame among Asians makes them less susceptible to develop eating disorders. However, recent research shows an increasing number of eating disorders among this group, especially after the group’s immigration to America and trying to fit in the Western image of beauty and attractiveness (Hall, 1995; Kawamura, 2002).

Body image perceptions and appearance ideals can differ within an ethnic group. Asian Americans, for example have more than 30 different subgroups including the Hmong, Chinese, Japanese, Filipino, Vietnamese, and Indians (Kawamura, 2002), and there are significant intra and inter group differences in body image perceptions within
this population. Traditional Asian values include respect for elders, submissiveness among women, and cultural collectivism, and these values shape ideas and thoughts regarding body image too (Hall, 1995; Kawamura, 2002; Uba, 1994). A collectivistic approach in the Asian culture prefers familial values and traditions, often favoring the group’s decision than an individual’s choice. The need for social approval has been known to predict eating disturbances among Japanese Americans (Mukai et al., 1998), and researchers believe that a perfectionist attitude puts more pressure on self-appearance, making Asian Americans susceptible to body image disorders (Kawamura, 2002). Further, pressures to confirm to the group influence self-image and appearance views, and could also result in intergenerational conflicts, as failure to comply with the family’s wishes is thought to bring shame to the family and community (Hall, 1995; Kawamura, 2002; Uba, 1994). Further, modesty, self-restraint, and avoiding conflict and emotional situations are this culture’s norm, making the issue of body image a harder one to communicate specially in a health care setting (Kawamura, 2002).

Traditionally, most Asian cultures valued plumpness, especially among females. Franzen and Smith (2009a) conducted focus group interviews with Hmong adults in Minnesota and found that a history of food insecurity among Hmong in Thailand or Laos was one reason to prefer plumpness, because body fat predicted survival during the times of food scarcity. Further, Singh and Young (1995) indicate that during the times of food scarcity and famine, heavier females are not only believed to survive, but are also fertile compared with thinner females, making a heavier female figure more desirable in cultures where food supply is scarce and/or limited. Because traditionally most Asian cultures associated a heavier body size with prosperity, fertility, beauty, and survival, it is
probable that despite Western emphasis on a thinner body frame, some Asian parents and grandparents are encouraging their children to eat more, leading to dueling cultural norms.

**Social Cognitive Theory (SCT) in Research Design**

This study used Bandura’s SCT as the theoretical framework. SCT explains human behavior in terms of a triadic, dynamic, and reciprocal model in which behavior, personal factors (including cognitions), and environmental influences all interact, and an individual’s behavior is uniquely determined by these interactions (Baranowski et al., 2002, p 153). SCT incorporates cognitive, emotional, and behavioral understandings in the context of behavior change. Further, SCT not only has the ability to explain how people acquire and maintain certain behavioral patterns over others, but it also can provide the basis for intervention strategies, making it an important instrument in psychosocial and behavioral research (Baranowski et al., 2002). Previously, health educators, researchers, and behavioral scientists have used SCT as a theoretical framework to investigate factors influencing eating behavior, food choices, and health status among children and adolescents (Baranowski et al., 2002; Story et al., 2002; Wiig & Smith, 2008).

One of the SCT constructs is the environment, which is believed to have a considerable influence on a person’s health and behavior. Environment refers to all the factors that can affect a person’s behavior but are physically external to that person (Baranowski et al., 2002). An individual’s social environment may have family members, friends, and peers; and the physical environment may include household environment, school, food outlets, and stores. Research has suggested that modifying an individual’s
environment can have positive influence on their diet; for example, increasing the availability of healthy food items such as fruits, vegetables, and dairy at home is likely to increase the intake of such foods by families (Hanson et al., 2005; Story et al., 2008). Among children, school environment is specifically important because usually 35% to 40% of youths’ total daily energy is consumed at school (French et al., 2003). In particular, vending machines and other foods sold à la carte in the school environment are usually higher in fats and sugars and have no federal nutritional guidelines to follow unlike the School Lunch Program (French et al., 2003), and therefore need special attention while planning nutritional intervention in a school environment.

A person’s behavior also influences and impacts their choices. Behavioral capability implies that a person engages in a behavior after having the knowledge about the behavior and possessing the skills to perform the behavior (Baranowski et al., 2002). For a successful behavioral change, cognitive knowledge, practice, and evaluation are also required.

Apart from environmental and behavioral factors, personal factors also contribute to change. Positive reinforcements are responses to a person’s behavior that increase the likelihood that the behavior will occur again. Self-efficacy is the confidence a person feels about performing a particular activity, including overcoming the barriers (Baranowski et al., 2002). Self-efficacy is an important aspect for behavioral change as it affects how much effort is invested in a given task (Bandura, 1993; Baranowski et al., 2002).

SCT also incorporates reciprocal determinism, where a person’s characteristics, behavior, and environment all interact and influence behavioral change (Baranowski et
al., 2002). An individual’s environment may influence his/her personal choices which could result in behavior change. For example, availability of fresh fruits and vegetables at home will probably result in an increased consumption of such foods. At the same time, personal and behavioral interactions are important too, suggesting that a child making good nutritional choices and/or eating healthier foods will depend on the child’s preference and knowledge of such foods and easy availability of nutritional foods in the home and other environment (Baranowski et al., 2002).
SUMMARY OF LITERATURE REVIEW

This literature review indicates that Hmong are an important Asian American group who are rapidly acculturating to the US norms, culture, and dietary habits. Acculturating to American dietary and food related habits has resulted in an increase in obesity and obesity related conditions such as type-2 diabetes, hypertension, dyslipidemia, and certain kinds of cancers among the Hmong (Clarkin, 2008; Franzen & Smith, 2010, 2009a, 2009b; Franzoi & Chang, 2002; Yang & Mills, 2008). Her and Culhane-Pera (2004) further indicate that such diseases are probably responsible for increasing rates in heart attacks, strokes, and kidney failure among this population.

Easy availability of high fat foods in the US is probably one of the reasons for increasing rates of obesity among Hmong. Franzen and Smith (2009a, 2009b) conducted focus group interviews among Hmong adults and children in Minnesota and found that Western environmental influences such as easy access to fast foods, increased consumption of sugary foods, and reduced physical activity have negatively impacted this group’s weight and health status. Furthermore, the Hmong adults agreed that diseases such as diabetes and hypertension which were not heard of in their home country of Laos were a common occurrence in this group after migrating to US, occurring even among children (Franzen & Smith, 2009a).

The literature review also suggests that body image research among Hmong is lacking, and it is timely to investigate Hmong body image perceptions and ideals, specifically from a cultural perspective. Stang et al (2007) compared the eating behaviors of Hmong adolescents with their white counterparts, and found that Hmong adolescents reported higher levels of weight concern, body dissatisfaction, dieting, unhealthy weight...
control behaviors, and less physical activity than white adolescents. Clearly, more research needs to be done studying Hmong body ideals and comparing traditional Hmong image ideals with the American body ideals, especially after the group’s immigration to America.

Finally, the literature review also discussed the usefulness of SCT as a theoretical framework in research designs. SCT is important to health education because it incorporates cognitive and emotional reasoning behind behavioral change. Further, SCT also explains how people acquire and maintain certain behavioral patterns over others, providing the opportunity for intervention strategies in health education (Baranowski et al., 2002).
Despite increases in obesity and obesity related conditions such as hypertension, diabetes, and cardiovascular diseases, research is lacking about dietary intake and body mass index (BMI) status for Hmong population, specifically children. With increasing rates of type-2 diabetes among Hmong (Culhane-Pera et al., 2005), factors influencing health and diabetes perceptions need to be investigated in this population from a cultural perspective. Also, research concerning body image is lacking among Hmong, and perceptions regarding body image ideals and traditional cultural norms of beauty need investigation as well. Increases in immigration and population density of Hmong in the US (Lee & Pfeifer, 2006) necessitate examination of health, dietary acculturation, and body image perceptions among this group.

The present project aims to fill gaps in previous research involving Hmong Americans. We believe that investigating Hmong health status and perceptions regarding diabetes and body image will help health educators, researchers, and community members to learn about the unique health needs of this cultural group, and enable them to design culturally appropriate interventions in the future.
RESEARCH QUESTIONS ADDRESSED WITHIN THE PROJECT

Project goal and research questions:

The overall goal of this project was to assess body image and body dissatisfaction, dietary acculturation issues, and to investigate health and diabetes perceptions among Minnesotan Hmong children, 9-18 years. To accomplish this, mixed methodology was used and included using Social Cognitive Theory (SCT) as the theoretical framework, assessing body satisfaction/dissatisfaction using silhouette drawing instrument, focus groups (from earlier component of the broader Hmong project), and anthropometric measurements. Further, dietary data were collected through two 24-hour dietary recalls collected on non-consecutive days, using multiple-pass interview techniques. Research questions addressing body image issues, health and diabetes perceptions, and dietary acculturation are outlined below in chapters two through four.

Chapter 2: Body image issues among Hmong American children

- How do Hmong children perceive their body size and what is the level of their body dissatisfaction?
- Does culture influence body image perceptions, ideals, and norms regarding beauty and attractiveness among Hmong children? How does this differ from the traditional Hmong body image ideals? Why?
- What factors influence body image perceptions among Hmong children?
- Are there any differences in US born and Thailand/Laos born Hmong children in their perceptions of beauty and attractiveness?
➢ Are self-reported measurements (height, weight, and BMI) appropriate to use among Hmong children?

Chapter 3: Investigating perceptions regarding health and diabetes among Hmong children

➢ With increasing rates in obesity and diabetes among Hmong, how do Hmong children perceive health and diabetes risk? What factors shape these perceptions?

➢ Are there any differences in US born and Thailand/Laos born Hmong children in their perceptions of health and diabetes? What factors shape these perceptions?

Chapter 4: Dietary acculturation among Hmong

➢ Has traditional Hmong diet changed after the group’s immigration to America? How?

➢ Does time lived in the US and the degree of acculturation impact the quality and quantity of diet consumed by the Hmong?

➢ Which specific nutrients are Hmong children’s diets deficient in? Which nutrients are consumed in excess?

➢ Are there any differences in food consumption patterns by food groups and nutrient intakes for Hmong children born in the US to those recently immigrated from Thailand and Laos?
OVERVIEW OF METHODOLOGY AND STUDY DESIGN

Introduction

This project integrated both qualitative (focus groups) and quantitative (silhouette drawing instrument, questions from a validated survey, dietary recalls, and anthropometric data) methodologies to apply a unique perspective in our investigation. Despite the methodological differences between qualitative and quantitative research, evidence suggests that using both approaches together can improve the understanding of behavior by providing both subjective (qualitative) and objective (quantitative) perspectives (Abusabha & Woelfel, 2003). Further, results obtained from qualitative and quantitative methods can be cross-validated and using the two methodologies together cancels their corresponding weaknesses (Abusabha & Woelfel, 2003).

The data presented in this project are part of a larger data set (Franzen & Smith, 2010, 2009a, 2009b) and here we will only address the components pertinent to body image, health and diabetes perceptions, and dietary acculturation among Hmong. All participants resided in Minneapolis/Saint Paul, MN and were recruited through Hmong newspapers, organizations, schools, churches, and community centers. Parental consent/child assent was obtained prior to data collection (Appendix A) and the Institutional Review Board of the University of Minnesota approved this study.

Qualitative analysis: Focus groups

This part of the project used data that was collected by two trained researchers. Researchers conducted twelve focus group sessions with Hmong children (N = 68) (Franzen & Smith, 2009b). Focus groups were conducted on-site at various Hmong organizations, and community leaders and key informants helped with the recruitment of
children. Discussion questions were based on SCT as the theoretical framework (Appendix B). Focus groups were age group specific and the maximum size per group was 5-8 children. For older children the groups were gender-specific and for younger children some sessions were gender-specific and some were mixed. Group discussions were conducted rather than personal interviews because key informants and parents within the Hmong community believed that small group discussions would be very appropriate to moderate among Hmong children. Portions of the focus groups pertaining to body image will be used in this component of the project.

Each focus group lasted for about one hour and was audiotaped and transcribed verbatim. Researchers coded focus group transcripts independently and common themes were identified with the frequency and intensity of opinions given consideration (Morgan & Krueger, 1998). If any discrepancies were noted in the coding, they were reconciled before more analysis. Reoccurring codes were organized into concepts and themes. Further, focus group concepts and themes were then organized using Nvivo (Qualitative Solutions and Research, NUD*IST Vivo version 1.2), a qualitative data-organizing program. Results from the focus group discussions were used to design a survey (quantitative analysis) which was later used to assess body image issues and health and diabetes perceptions among Hmong children. Further, the themes pertinent to ‘body image’ were extracted from focus groups and used for this component of the study.

**Quantitative analysis: Anthropometric measures, survey, silhouette drawing instrument, and dietary recalls**

Anthropometric measures included recording participant heights and weights. Measures were done using standard procedures with participant shoes and outer heavier
clothing removed (Frisancho, 2008). BMIs were calculated as weight (kg)/height (m)^2, which were then plotted on the CDC (2009) BMI-for-age gender specific growth charts to obtain percentiles, which rank underweight children as < 5th percentile, healthy weight as 5th to < 85th percentile, overweight as 85th to < 95th percentile, and obese children as ≥ 95th percentile. For height, rankings were < 5th percentile for short, 5th to < 85th percentile for average, and ≥ 85th percentile for tall children.

A quantitative survey (Appendix C) was designed after analyzing results from focus groups discussions. The survey was administered to three hundred and thirty five Hmong children. About 65% of the children participating in the focus groups also participated in the survey component of the project. The survey questions were evaluated using a 5 point (strongly disagree (-2), disagree (-1), unsure (0), agree (+1), strongly agree (+2)) psychometric Likert scale. The data were first checked for normality and analyzed using the Statistical Package for the Social Sciences (SPSS version 17; Chicago, IL) software. The significance level was set at \( P < 0.05 \) for all data.

Silhouette drawing instrument was used as the primary body image assessment tool (Figure 1). Earlier, silhouette instrument has been used to measure body dissatisfaction among children and adults and research has indicated strong test-retest reliability after using such an instrument (Collins, 1991; Thompson & Altabe, 1991). The silhouette instrument used in this project was adapted from an existing instrument used for Native Americans (Stevens et al., 1999) as no such instrument exists for Hmong children.

The instrument included a set of eight gender-specific figural drawings ranging in size from underweight to obese (Figure 1). Participants were asked to select one figure
that represents their current body size (perceived body) and one figure that represents their ideal body size (ideal body). The difference between the two figures was the participant body dissatisfaction score (Gardner, 2002, 2001). Further, the difference between perceived and ideal body was absolute, and the larger the value of discrepancy, the greater the body dissatisfaction.

Dietary data were collected through two 24-hour dietary recalls using four stage multiple-pass interview technique method (Appendix D). In the first stage, a complete list of foods and beverages consumed by the child was asked. In the second stage, a detailed description of each food and beverage consumed was obtained. In the third stage, an estimate in the amount of each food and beverage item consumed was recorded. In the fourth stage, the recall was reviewed by the researcher with the child to ensure that all items, including the use of vitamins and mineral supplements have been noted. ESHA Food Processor® SQL Software (Version 10.4.0; 2009) analyzed 24-hour recalls by computing nutrient intake. For MyPyramid analysis, ESHA was used to compute intake for grains, vegetables, fruits, and meat and beans. The intake for fats, oils, and sweets was computed by following MyPyramid guidelines (The Food Guide Pyramid, USDA), which define a serving of fat as number of grams in 1 tbsp of fat for butter, margarine, oils, and shortening. For meats, an additional fat serving was reported as a multiple of the fat standard for the specific meat, and for milk products and mixed foods, an additional fat serving was reported as a multiple of 12.8 grams, the weight of 1 tbsp of shortening (The Food Guide Pyramid, USDA). A serving of sugar was defined as the number of grams in 1 tsp of sugar (4 g) (The Food Guide Pyramid, USDA). The results from the 24-
hour data and MyPyramid analysis were then imported into SPSS (version 17) for further statistical analysis.
Figure 1. Silhouette Drawing Instrument used to Assess Body Dissatisfaction. (Adapted from Stevens et al. (1999))

On separate gender-specific forms boys and girls are asked:

a) Circle the boy/girl that looks like you now (perceived body)
b) Circle the boy/girl that you want to look like (ideal body)

Body Dissatisfaction = | Rank of one’s perceived body shape - Rank of one’s ideal body shape |
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CHAPTER 2

Assessing Body Image Issues and Body Satisfaction/Dissatisfaction among Hmong American Children 9-18 years of age Using Mixed Methodology

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This study investigated body image issues and the usefulness of self-reported measurements among Hmong American children, 9-18 years using mixed methodology. Twelve focus groups were conducted ($N = 68$) and a silhouette drawing instrument and six questions pertaining to body image were administered ($N = 335$). About 50% of the children were either overweight or obese and 23% were short statured relative to US norms. About 70% of the girls and 53% of the boys selected smaller body ideals than their perceived body sizes. Further, 21% of the girls and 31% of the boys were satisfied with their bodies. Children underestimated their weights and overestimated their heights. In focus groups participants reported that parents, peers, and media shaped body image perceptions among them. Our results indicate that Hmong children are dissatisfied with their bodies and children endorsed American ideals of beauty and attractiveness more than the traditional Hmong body ideals.

Keywords: body image, body dissatisfaction, Hmong children, self-reported measurements, mixed methodology, Asian Americans
Introduction

Body image is a multidimensional construct that includes cognitions, perceptions, and attitudes towards one’s body. Body image concerns include overvaluation of appearance, body dissatisfaction, and/or a distorted view of our body (Cash, 2002). These concerns start as early as age six (Smolak, 2002), and are influenced by many factors including one’s physical characteristics, personality, interpersonal experiences, and sociocultural influences (Cash, 2002; Grogan, 2008). During adolescence, developmental challenges such as puberty, emerging sexuality, and gender roles also influence or are influenced by body image (Levine & Smolak, 2002). Researchers are interested in this topic because negative body image is associated with eating disorders, low self-esteem, depression, anxiety, obesity, and obsessive-compulsive tendencies (Cash, 2002; Paxton & Franko, 2010; Smolak, 2002; Verplanken & Velsvik, 2008).

Body image perceptions and ideals differ within and between various cultural groups. While Western cultures tend to idealize thinness among females and muscularity among males (Grogan & Richards, 2002; Pope, Phillips, & Olivardia, 2000), cultures where food supplies are or were scarce usually associate a larger body size with health, wealth, beauty, fertility, and food security (Etcoff, 1999; Franzen & Smith, 2009a). However, with immigration to the West, globalization, and mass media’s influence, the traditional heavier beauty ideal in some cultures has transformed to fit a more Western thinner/muscular ideal (Becker, 2004; Striegel-Moore & Franko, 2002). Asian American cultures may be influenced by Westernization. With a population of about 15 million (United States (US) Census Bureau, 2007), Asian Americans are one of
the fastest growing minority groups in the US. There are over 30 different Asian American ethnic subgroups (Kawamura, 2002), and one of them is Hmong. Originally from Laos, many Hmong secretly assisted the US military and Central Intelligence Agency (CIA) during the Vietnamese Conflict (Fadiman, 1997; Franzen & Smith, 2009a; Lee & Pfeifer, 2006; Yang, 2001). Post-Vietnam Conflict in Laos, communists targeted Hmong because of their help to the US, and many Hmong suffered hardships including genocide, persecution, poverty, excessive labor, depression, and food insecurity, and resettled in countries such as Thailand, Australia, France, and the US (Johnson, 2002; Lee & Pfeifer, 2006; Yang, 2001). There are about 200,000 Hmong in the US, and approximately 70,000 Hmong live in Minnesota (MN) (US Census Bureau, 2007).

Research concerning body image is lacking in Asian Americans, specifically among the Hmong. Previously, researchers have investigated Hmong health status and eating behaviors and have found increases in obesity and obesity related conditions such as type-2 diabetes, hypertension, and dyslipidemia among the Hmong, specifically after the group’s migration to the US (Clarkin, 2008; Franzen & Smith, 2009a, 2009b, 2010; Franzoi & Chang, 2002; Her & Mundt, 2005; Yang & Mills, 2008). Her and Culhane-Pera (2004) further indicate that such diseases may be responsible for increasing rates in heart attacks, strokes, and kidney failure among the Hmong population. Recent investigations regarding dietary practices of Hmong children and adults living in Minnesota suggest that Western environmental influences such as easy access to fast foods, increased consumption of sugary foods, and reduced physical activity negatively impacted this group’s weight and health status (Franzen & Smith, 2009a, 2009b, 2010).
Furthermore, Hmong adults reported that diabetes and hypertension have become common among their people post-migration but such diseases were rare occurrences when they lived in Laos (Franzen & Smith, 2009a). Stang et al. (2007) compared the eating behaviors of Hmong adolescents with their white counterparts, and found that Hmong adolescents reported higher levels of weight concern, body dissatisfaction, dieting, and unhealthy weight control behaviors, and less physical activity than white adolescents.

To our knowledge, no research has investigated factors influencing body image perceptions, ideals, and traditional cultural norms of beauty in the first and second generation Hmong migrants. Increases in immigration and population density of Hmong in the US (Lee & Pfeifer, 2006) necessitate examination of body image among them. Hence, the purpose of this study was to (a) assess overall body satisfaction/dissatisfaction, (b) identify whether and how traditional culture and/or host culture affects perceptions and attitudes towards body image, and (c) investigate usefulness of self-reported measurements among Hmong American children 9-18 years of age using mixed methodology.

Methods

Because body image is a multidimensional construct, we integrated both quantitative (silhouette drawing instrument, six questions from a validated survey, and anthropometric data) and qualitative (focus groups) methodologies in our study design to apply a unique perspective in our investigation. Furthermore, despite the philosophical and methodological differences between quantitative and qualitative research, evidence
suggests that using both approaches together can improve the understanding of complicated dynamics of human behavior (Abusabha & Woelfel, 2003). The data here are a part of a larger data set (Franzen & Smith, 2009a, 2009b, 2010) and here we will only address the components pertinent to body image. All participants resided in Minneapolis/Saint Paul, MN and were recruited through Hmong newspapers, organizations, schools, churches, and community centers. Parental consent/child assent was obtained and the Institutional Review Board of the University of Minnesota approved this study.

Survey

Participants

Three hundred and thirty-five Hmong children (150 boys and 185 girls) participated in the survey. Of these children, some were born or raised in the US (Born-US) and were either 9-13 years old (Born-US-younger, n = 144) or 14-18 years old (Born-US-older, n = 156). Others were born or raised in Thailand/Laos (Born-T/L) and had been living in the US for ≤ 5 years and were either 9-13 years old (Born-T/L-younger, n = 21) or 14-18 years old (Born-T/L-older, n = 14).

Anthropometric Measurements

Height and weight were measured using standard procedures (Frisancho, 2008), with outer heavy clothing and shoes removed. Body mass index (BMI) was calculated as weight (kg)/height (m)$^2$ and plotted on the Centers for Disease Control and Prevention (CDC) BMI-for-age gender-specific growth charts to obtain a percentile ranking and guidelines rank underweight children as < 5$^{th}$ percentile, healthy weight as 5$^{th}$ to < 85$^{th}$.
percentile, overweight as 85th to < 95th percentile and obese children as ≥ 95th percentile (CDC, 2009a). We chose to use CDC guidelines because these are currently the standard of choice in the US and most children in our sample were US born. Further, CDC promotes the use of one set of growth charts for children of all racial and ethnic groups within the US (CDC, 2009b). For height, children were ranked in categories of < 5th percentile (short), 5th to < 85th percentile (average), and ≥ 85th percentile (tall). Lastly, children were asked to self-report their height and weight prior to actual measurements being taken.

**Body Image Assessment**

On the day of the survey, an eight figure, gender-specific silhouette drawing instrument was administered to children, with figure 1 being the thinnest and figure 8 being the heaviest (Figure 1). Previous research has indicated strong test-retest reliability after using such an instrument among children and adolescents (Collins, 1991; Thompson & Altabe, 1991). The silhouette instrument used for this project (Stevens et al., 1999) was not specifically designed for Hmong children, therefore it was pre-tested with 35 Hmong children for understandability and acceptability prior to implementation, and all children could relate to it. Silhouette questions pertaining to body image were (a) circle the boy/girl that looks like you now (perceived body) and (b) circle the boy/girl you want to look like (ideal body). Children were asked to circle one silhouette per question.

Furthermore, six questions pertaining to body image were also pre-tested and used to assess body satisfaction/dissatisfaction and were evaluated using a 5 point (strongly disagree (-2), disagree (-1), unsure (0), agree (+1), strongly agree (+2)) psychometric
Likert scale. Questions were: (a) I would like to lose weight, (b) I would like to gain weight, (c) my weight is just right, (d) I would like to be taller, (e) I would like to be shorter, and (f) my height is just right. After the children completed the survey and body image assessment, researchers checked forms for unanswered questions, questions with multiple responses, and circling of more than one answer. If such errors existed, the children were asked to choose only one answer, usually it was the case of a child’s eye not following the response line, resulting in the circling of two responses on one line and leaving a blank on the next line.

Focus Groups

Participants

Sixty-eight (36 boys and 32 girls) Hmong children, ages 9-18 years participated in the focus groups. Of these children, some were born or raised in the US and were either 9-13 years old (Born-US-younger, n = 22) or 14-18 years old (Born-US-older, n = 25), while others were born or raised in Thailand/Laos and had been living in the US for ≤ 5 years and were 14-18 years old (Born-T/L-older, n = 21). About 65% of the children who participated in the focus groups also participated in the survey portion of the study.

Procedure

Two trained researchers conducted twelve focus group sessions with Hmong children. Group discussions were conducted rather than personal interviews because key informants and parents within the Hmong community believed that small group discussions would be very appropriate to moderate among Hmong children. Furthermore,
group discussion allowed for the opinions of more children to be heard than would have been possible with individual interviews which usually have a smaller sample size.

Focus groups were conducted on-site at various Hmong organizations, and community leaders and key informants helped with the recruitment of children. Focus groups were age group specific and the maximum size per group was 5-8 children. For older children the groups were gender-specific and for younger children some sessions were gender-specific and some were mixed, but no differences in conversations were noted after moderating younger groups involving both genders.

Researchers created a comfortable and permissive environment for the children and used ice-breaker questions to start the discussions (Krueger & Casey, 2009). Children appeared to have no problems expressing their opinions and talked freely. Furthermore, focus groups with children are highly appropriate as the literature shows (Evano, Wilson, Buck, Torbett, & Williams, 2006; Geller, Schrader, & Nansel, 2007; Kubil, Lytle, & Fulkerson, 2005; Lautenschlager & Smith, 2007).

Each focus group lasted approximately 60 minutes and was audiotaped and transcribed verbatim. Researchers coded transcripts independently and common themes were identified with the frequency and intensity of opinions given consideration (Morgan & Krueger, 1998). Sample focus group questions and prompts were: (a) We have heard parents and others say that traditionally heavier women were desirable as marriage partners. Have you ever heard that? Why do you think that is? (b) In Hmong culture what kind of body shape is preferred? What do you prefer? To be heavier? To be thinner? To be just as you are? Do you and your parents/grandparents think differently or the same
about your desired body shape? (c) How important is body weight to you when you look at others? For example, do you have both heavy and thin friends? Is their body weight important to you? When you think about boys/girls (depending on gender) what is important to you? Is their weight or height important? (d) Does media (TV, internet, magazines) impact how you feel about yourself? What kinds of TV programs and/or commercials help you decide what you should look like? (e) What or who do you think is beautiful? Do you feel pressured to look a certain way?

Data Analysis

Quantitative data were analyzed and checked for normality with the Statistical Package for the Social Sciences (SPSS version 17; Chicago, IL). Descriptive statistics computed means, standard deviations, frequencies, and percent responses. One-way analysis of variance (ANOVA) with Post Hoc Tukey honestly significant differences (HSD) analyzed means for (a) anthropometric measures (Table 1) and (b) body dissatisfaction scores within age groups, BMI percentiles, and height percentiles (Table 2). Paired samples t-tests compared differences between perceived body and ideal body size by age groups, BMI percentiles, and height percentiles (Table 2). Sign test compared differences in the proportion of children choosing larger or smaller body sizes than their perceived body sizes. Body dissatisfaction (BD) score was calculated by the absolute difference between perceived and ideal body size and a higher score indicated greater body dissatisfaction. The association between BD scores and perceived body size, self-reported measurements, and actual measurements was examined using the Pearson correlation (r). Pearson correlation was also used to investigate the associations for the
six body image questions. Significance level was set at $p < .05$ for all data. For focus group analysis, two researchers coded each of the twelve transcripts independently. If any discrepancies were noted in the coding, they were reconciled. Reoccurring codes were organized into concepts and themes. Further, focus group concepts and themes were then organized using Nvivo (Qualitative Solutions and Research, NUD*IST Vivo version 1.2), a qualitative data-organizing program.

**Results**

**Sample Characteristics**

Weights and heights by birth location within age groups were significantly different, therefore sample characteristics for children born in the US and those born in Thailand/Laos are listed separately (Table 1). Among boys, those born in the US were significantly heavier, $t (148) = 2.7, p < .01, r = .29$, and taller, $t (148) = 1.7, p < .01, r = .20$ than those born in Thailand/Laos (see Table 1 for means and standard deviations). Further, older girls born in the US were significantly heavier, $t (100) = 2.0, p < .01, r = .49$ than those born in Thailand/Laos. Of all children, about 30% were obese (BMI-for-age $\geq 95^{th}$ percentile) and 16% were overweight (BMI-for-age $85^{th}$ to $< 95^{th}$ percentile). Further, 23% of the children were short statured (height-for-age $< 5^{th}$ percentile) and 4% were taller for their ages (height-for-age $\geq 85^{th}$ percentile).

**Body Dissatisfaction**

About 70% of the girls and 53% of the boys selected smaller body ideals than their perceived body size, while 9% of the girls and 16% of the boys selected larger body ideals than their perceived body size. Only 21% of the girls and 31% of the boys were
satisfied with their bodies, and chose a common silhouette for their perceived and ideal bodies. Sign test revealed that most children selected smaller body ideals than larger ones \( (z = -10.5, p < .001) \). Among girls, 50% of 9-13 year olds and 26% of 14-18 year olds wished to look like the thinnest silhouettes (sizes 1-3). Among boys, 21% of 9-13 year olds and 4% of 14-18 year olds wished to look like silhouettes 1-3. Of all children, about three-fourths chose average silhouettes (sizes 4 and 5) as their ideal bodies, and none chose either of the heaviest silhouettes (size 7 or 8) as their ideal.

Body dissatisfaction (BD) scores for overweight and obese children were significantly higher than healthy weight children (Table 2). Although obese children perceived themselves significantly heavier compared with their healthy weight counterparts \( (t(279) = 5.0, p < .001, r = -.61) \), only 4% chose the heaviest silhouette (size 8) for their perceived body size. Most obese children (82%) chose near average silhouettes (sizes 5 and 6) as their perceived body size. Significant and positive association was found between perceived body size and BD score \( (r = .64, p < .001) \).

Survey Questions

Children who agreed/strongly agreed about wanting to lose weight, self-reported themselves heavier \( (r = .20, p < .001) \), had higher actual BMI percentile \( (r = .46, p < .001) \), and higher BD score \( (r = .48, p < .001) \). Children who agreed/strongly agreed about their weight as just right were also satisfied with their height \( (r = .25, p < .001) \) and had lower BD score \( (r = -.20, p < .001) \).

About 70% of the children wanted to lose weight and 80% wanted to be taller in stature. Among obese children \( (n = 102) \), 88% wanted to lose weight and among healthy
weight children \((n = 179)\), 54\% wanted to lose weight. Among short statured children \((n = 78)\), 96\% wanted to be taller, and among average statured children \((n = 242)\), 76\% wanted to be taller in stature.

*Self-reported Versus Actual Weight, Height, and BMI Measurements*

Boys and girls underestimated their weights by 2.0 kg and 2.2 kg and overestimated their heights by 1.2 cm and 1.0 cm respectively. Girls and younger boys significantly underestimated their weights while older children significantly overestimated their heights (Table 3). Overweight and obese children significantly underestimated their weights compared with healthy weight children. Among children who underestimated their weights and overestimated their heights, the self-reported BMIs (calculated) were underestimated (Table 3).

Significant and positive associations were found between self-reported weight and actual weight \((r = .93, p < .001)\), self-reported height and actual height \((r = .64, p < .001)\), and self-reported BMI and actual BMI \((r = .55, p < .001)\). Significant and positive associations were also found between self-reported weight and BD score \((r = .17, p < .01)\) and actual weight and BD score \((r = .33, p < .001)\). Significant and negative association was found between self-reported stature and BD score \((r = -.11, p < .01)\), and none between actual stature and BD score.

*Focus Group Results*

Focus group data were collected prior to the survey and are used to support survey findings. During focus group discussions, children talked frankly about their perceptions of beauty, attractiveness, and body ideals, and how sociocultural influences and
traditional norms influence their attitudes towards body image. From discussions, three themes emerged relating to body image: (a) traditional Hmong female body, (b) current Hmong American beauty ideals, and (c) factors influencing changes in body image perception.

**Traditional Hmong Female Body**

Sub-themes relating to this theme were defining traditional female body and reasons for preferring plumper females.

*Defining traditional female body.* Children discussed traditional body shape in terms of heavier body weights and plumper silhouettes being preferred among girls and young women. One boy commented, “In Thailand, there is personal preference…for women who are a bit bigger” (Born-T/L-older). However, some newly immigrated children reported that their family elders were aware of the preferred female body size in the US as reflected by one girl, “My grandmother tells me that here [in US] nobody like the big [body]…they [in US] like the skinny girl and we have to be skinny, not fat…” (Born-T/L-older).

*Reasons for preferring plumper females.* Children reported that plumper female size was traditionally associated with health, wealth, prosperity, and food security. Plumpness was an indicator of a person’s wealth as one boy stated, “I remember my dad telling me…the fatter you are tells the more how rich you actually are” (Born-US-older). Female plumpness also indicated food security as another commented, “If they [girls] are plump, that’s good too, ‘cause that tells they are wealthy, to buy like the meat and stuff” (Born-US-younger). Of interest, thinner girls were seen as unhealthy as one commented, “If you
are too small or skinny, that means you are not getting enough food into your system…that won’t be healthy” (Born-US-younger).

Current Hmong American Beauty Ideals

Sub-themes relating to this theme were defining Hmong American beauty ideals and behaviors used to achieve the Hmong American beauty ideals.

Defining Hmong American beauty ideals. While traditionally plumpness was valued within Hmong culture, children believed that the new body ideal was to be tall and slim (for boys and girls) and muscular (for boys). As one boy commented, “I wanna be six-foot [tall], and slim, muscular for modeling” (Born-US-younger). For some children the desire to be lean was associated with wanting to be selected as a marriage partner as one girl stated, “If you are fat, you are not beautiful…and [it’s] hard to find a husband” (Born-T/L-older).

Behaviors used to achieve the Hmong American beauty ideals. According to children, dieting, careful food choice, and skipping meals were some behaviors used to achieve the changing beauty ideals. These behaviors were reflected as altered eating patterns among children as one child said, “…some girls, they don’t eat like for about three days and on the fourth day, they eat a little bit and then they wait…because they don’t wanna become a fat girl, they wanna be skinny” (Born-US-younger). Some children struggled with food choices saying, “I like to watch my weight…just looking at the type of food that’s made, I’ll debate in my head if it’s worth burning it off…I try to keep in shape!” (Born-US-older).
Factors Influencing Changes in Body Image Perception

Sub-themes relating to this theme were parents, peers, and media.

Parents. Some children discussed how parents influenced their body image perceptions by commenting about their child’s body weight, setting household norms in physical activity, favoring certain body characteristics in potential mates, and monitoring their child’s diet. One boy reflected, “He [Dad] doesn’t want me to [be] too big…so he wants me to watch what I eat…and [tells me to] play soccer harder, play more, get dirty…my mom puts me in swimming and told me I have to watch my weight” (Born-US-younger). In some households, children reported that their parents monitored their eating behavior to encourage change, as one girl stated, “…I am really overweight for my age…if I eat too much or he [Dad] sees me sitting on the couch eating… he’ll give me “the look”…I know what he’s thinking!” (Born-US-older, BMI = 35.40 kg/m$^2$). Some children discussed their parent’s preference towards taller stature, as one boy told the group, “My dad…don’t like me and my brother dating short girls…they [parents] choose someone tall…they want our kids to be tall” (Born-US-older). The desire for tallness among children was also captured in the survey results with the vast majority of them wanting to be taller.

Peers. Children reported that peers also influenced body image perceptions among them, especially in regard to physical beauty. As one girl said, “There are some guys who are so cocky and they want a girl who looks good with them” (Born-US-older). Another believed appearance expectations between the sexes, specifically regarding ideal body weight, should be determined or set by one’s own appearance. Thus a guy who is not so
attractive should not expect to get a beautiful mate, as expressed by one girl: “It [girls worrying about their body weight] depends on how the guy looks [in appearance]...a big, ginormous, and ugly guy should not expect much” (Born-US-older). Among most boys, slender girls were found more desirable as friends and romantic partners, as one reflected, “I don’t [like plumper girls], I am going to say right now, not really” (Born-US-older). While parents and peers were important in shaping body image perceptions, children reported that media too inspired change.

**Media.** Children talked about how television influenced their perception of beauty and attractiveness. Korean media appeared to have a substantial influence on the children, especially girls. One commented, “I don’t really pay attention to Hmong guys much, [but prefer] my Korean guys on the computer…I like their hair and their style, their language” (Born-US-older). Furthermore, television programs and commercials highlighting workout equipment affected some children’s thoughts about body weight and shape. American media also seemed to introduce new ideals in style, beauty, and attractiveness through channels such as MTV, VH1, and Bravo especially for those recently arriving from Thailand or Laos. Hence, focus group discussions highlighted key factors shaping body image perceptions among Hmong children.

**Discussion**

This study found that the body image ideals among Hmong children closely match the American ideals of beauty and attractiveness, as indicated by the children’s desire to be thinner and taller than their perceived bodies. Furthermore during focus groups, children reported that factors such as parents, peers, and media strongly
influenced their body image attitudes and tended to endorse the American body ideals more frequently than they endorsed the traditional Hmong preferences. Our study also investigated the association between acculturation, years lived in the US, and body dissatisfaction scores among Hmong children, but significant correlations were not found. Almost half of the children in our sample were either overweight or obese, and one-fourth were short-statured. Most overweight/obese children (88%) wanted to lose weight and almost all of the short-statured children (96%) wanted to be taller, indicating body dissatisfaction. Research has found that body dissatisfaction is associated with the risk of developing eating disorders, low self-esteem, depressive symptoms, and obesity (Cash, 2002; Paxton & Franko, 2010; Smolak, 2002; Verplanken & Velsvik, 2008), suggesting that the children in our sample might be prone to develop such conditions now or in their future.

**Body Dissatisfaction and Idealization of Thinness and Tallness**

Results from our survey and focus groups suggest that body image issues show up at an early age among Hmong children. Although earlier research on body dissatisfaction has focused on girls (Durkin & Paxton, 2002; Tiggemann & Lynch, 2001), recent research (including ours) indicates that boys are equally prone to body image issues (Grogan & Richards, 2002; Pope et al., 2000). Body dissatisfaction among boys may result in harmful situations including body dysmorphic disorder (preoccupation with perceived flaws regarding body and appearance), possible use of anabolic steroids, suicidal thoughts, depression, and low self-esteem (Olivardia, Pope, Borowiecki, & Cohane, 2004; Pope et al., 2000). Our body image assessment and survey results
indicated that only 16% of the boys chose a larger body ideal compared with their perceived bodies and about 63% of the boys wanted to lose weight. However during focus group discussions, boys also verbalized that they liked a more muscular body. This observation is similar to that found among other young Western males (Pope et al., 2000).

Our results also indicated a strong desire for thinness among our study participants and children used unhealthy weight control behaviors including dieting, skipping meals, and limiting the intake of high caloric foods to align themselves to a thinner ideal. The desire for thinness among Hmong culture is new because of the culture’s preference for a heavier body, specifically among girls and women. Franzen and Smith (2009a) conducted focus group interviews with Hmong adults in Minnesota and found that a history of food insecurity among Hmong in Thailand or Laos was one reason to prefer plumpness, because body fat predicted survival during the times of food scarcity and famine. Further, plumper females were believed to have a stronger body type, better for childbearing and thus were preferred as marriage partners compared with thinner females. However, from our survey analysis and focus group discussions, it was clear that the preference towards a heavier figure was fading among young Hmong Americans and none of the children, including the girls idealized a heavier body.

Apart from struggling for a thinner body, the vast majority of the children desired to be taller in stature. Earlier, Steckel (1995) found that tall stature was a positive determinant of a person’s health, income level, and family’s social status in developed as well as developing countries. During our own conversations with children, it was
apparent that children associated tallness with wealth, social status, and American identity. Additionally, it seemed that the genetic susceptibility to a shorter stature coupled with the desire for taller grandchildren may be pushing some Hmong parents to advice their children to date taller romantic partners.

Factors Affecting Body Image and Body Weight Perceptions

According to the children in our sample, external influences such as parents, peers, and media affected their body image and body weight perceptions. During focus group discussions, children reported that some parents showed concerns about their child’s excess weight by watching or monitoring what/when the child was eating, engaging their children in regular physical activity, and discouraging an unhealthy lifestyle. Birch and Fisher (1998) believe that parental restriction or control over their child’s intake of certain foods may inversely result in children liking these foods. However, from a cultural perspective, children in Asian cultures try hard to please their parents by complying within most of their wishes (Uba, 1994). As more immigrants merge into the American society, it will be important to learn whether cultural practices regarding parental influence on children continues, or whether shifts in parental influence also acculturate.

Participants reported that peers also shaped body weight perceptions among them, although peer influences appeared to be more profound among older children than younger ones, indicating possible maturity differences in body image perceptions between younger and older children. For example, older boys associated a girl’s slenderness with beauty and desired them as romantic partners. The appearance appeal
relating to body weight was bidirectional in our study and most older girls were attracted
to taller and leaner boys. It is unclear whether parents and children differ in expectation
of the child’s body shape and that of their desired mate’s body shape. It appears that
tallness is a body characteristic desired by both generations, though parents may prefer
heavier body size and if so, this could lead to dueling cultural norms and
intergenerational conflicts.

Apart from parents and peers, children reported that media also influenced their
body image perceptions. The Western media’s idealization of thinness among girls and
muscularity among boys has resulted in body dissatisfaction among boys and girls in both
Western (Pope et al., 2000; Tiggemann, 2005) and non-Western cultures (Becker, 2004;
Hall, 1995). During our discussions with children, it was clear that they were strongly
influenced by television channels such as MTV, VH1, and Bravo, and aspired for thinner,
taller, and more muscular body ideals and watched such channels regularly, using them
as models for hair styles, fashion, and body shape/size.

Self-reported Versus Actual Weight, Height, and BMI Measurements
Lastly, our study also compared the self-reported weights, heights, and BMIs (calculated)
with the children’s actual body measurements to determine whether self-reported
measurements are reliable measures among Hmong children. Children with high self-
reported weights had higher BD scores, and those with high self-reported statures had a
lower BD score, although the effect sizes for these associations were small.
Although the associations between self-reported and actual measurements were high
(ranging from 0.55 to 0.93), children significantly underestimated their weights and
overestimated their heights. This observation suggests that self-reported measurements should be interpreted with caution among Hmong children. In a multiethnic sample of adolescent participants (including Asians) Himes, Hannan, Wall, and Neumark-Sztainer (2005) found that the errors in self-reported measurements are related to personal characteristics of youth such as age, race/ethnicity, and socioeconomic status. Martin, Frisco, and May (2009) further found that Asian American female adolescents were more likely to underestimate their weights than their white counterparts, and cautioned that inaccurate weight perceptions might lead to unhealthy weight control practices among these adolescents. Because our results indicate that in general, Hmong children underestimated their weights and overestimated their heights, we suggest that actual measurements should be used whenever possible.

Limitations

While our study added a new chapter in the ever-growing field of body image, it has some limitations. Collecting data with children can be challenging. However, we believe that one strength of this study is the use of mixed methodologies. Quantitative methodology is useful for collecting “countable” data, but it fails to answer the “why” and “how” questions. In contrast, qualitative methodology answers the “why” and “how” questions and fills in the gaps that surveys leave. Using the two methodologies together minimizes their weaknesses and draws on their strengths.

Furthermore, although the use of silhouette instrument to assess body dissatisfaction has been suggested as an appropriate tool among children and adolescents (Collins, 1991; Thomson & Altabe, 1991), Gardner (2001) indicates that presenting silhouette drawings
in an ascending order might account for artificially higher test-retest reliability values because participants have little difficulty remembering which figure they selected previously.

Another possible limitation to this study is how we defined body dissatisfaction. We discussed it as body size and shape, such as weight and tallness/shortness, and defined it as an absolute difference between one’s perceived and ideal body shape. However, in actuality, body dissatisfaction is a multidimensional measure and could include dissatisfaction from a specific body part (hips, stomach), facial feature (eyes, nose), general appearance, or other weight related site in the body.

Also, our use of focus group methodology among children might have led some participants to modify their answers for social acceptance and/or desirability from peers. However, we feel that the use of age- and gender-specific groups might have minimized this problem and most children were very comfortable in speaking their minds; conversation within the groups flowed freely.

Furthermore, we checked a child’s response to survey and body image assessment to avoid any incomplete and/or no responses and if such errors existed, children were asked to pick just one answer and were given the opportunity to select an “unsure” response. Some believe that the practice of asking a child to select only one response may alter the child’s opinion and thus can incorporate a subjective error into the data set. However, in our study, we assured the children that there were no right or wrong answers and they could choose any response they desired. Also, while going through the completed responses, we asked for a child’s opinion regarding incomplete/no responses only once
and did not further question the child. The researchers’ intent was simply to provide a complete data set. Children could leave the study anytime during the data collection if they did not feel like continuing and their opinions and wishes were respected by the researchers.

Additionally, while we believe our sampling methods provided a representative sample of Hmong children in Minneapolis/Saint Paul area, but the results may not be generalizable to other Hmong children in the US. Lastly, our results were indicative of body image issues at one point in these children’s lives, but longitudinal studies regarding body image are needed to assess changes in image over time.

**Conclusions**

This study found that most younger and adolescent Hmong children are dissatisfied with their body size and appearance. Body image research is limited among Asian Americans, and to our knowledge, this is the first study which assesses body satisfaction/dissatisfaction among Hmong using quantitative as well as qualitative methodologies. Body dissatisfaction among children can lead to unhealthy and potentially harmful behaviors such as dieting, eating disorders, disordered eating, and psychological issues, indicating that these children might suffer or are potentially suffering from such conditions. It is therefore important that future researchers and organizations educate Hmong children, aiming to improve their body image by planning and implementing culturally and linguistically appropriate education and intervention programs. Such programs may include lesson plans and activities designed for Hmong children and educating them about media, normative changes in body during puberty,
selecting realistic role models, and respect and tolerance for people of all shapes and sizes. Lastly, knowing that parental influence is important in the Asian culture, we believe that intervention programs should try to educate Hmong parents about media’s effect on children, being aware of the negative body image signs among their children, and communicating with their child about body image issues.
References


Table 1
Sample Characteristics of Hmong Children

<table>
<thead>
<tr>
<th></th>
<th>Born in United States</th>
<th>Born in Thailand or Laos</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Age (years)</td>
<td>11.52 (1.27)</td>
<td>15.70 (1.46)</td>
</tr>
<tr>
<td>Grade level, n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary school</td>
<td>25 (34%)</td>
<td>0</td>
</tr>
<tr>
<td>Middle school</td>
<td>48 (66%)</td>
<td>8 (13%)</td>
</tr>
<tr>
<td>High school</td>
<td>0</td>
<td>51 (85%)</td>
</tr>
<tr>
<td>Post-secondary</td>
<td>0</td>
<td>1 (2%)</td>
</tr>
<tr>
<td>Anthropometric measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>49.91 (18.49)*</td>
<td>69.78 (17.91)*</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>146.01 (11.27)*</td>
<td>163.53 (7.22)*</td>
</tr>
<tr>
<td>Body mass index</td>
<td>22.83 (5.73)*</td>
<td>25.94 (5.75)</td>
</tr>
</tbody>
</table>
### Body mass index percentiles, n (%)

<table>
<thead>
<tr>
<th>Percentile</th>
<th>5th to &lt; 85th (healthy)</th>
<th>85th to &lt; 95th (overweight)</th>
<th>≥ 95th (obese)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>32 (44%)</td>
<td>25 (42%)</td>
<td>8 (88%)</td>
</tr>
<tr>
<td></td>
<td>42 (59%)</td>
<td>12 (17%)</td>
<td>1 (11%)</td>
</tr>
<tr>
<td></td>
<td>51 (53%)</td>
<td>18 (19%)</td>
<td>27 (28%)</td>
</tr>
<tr>
<td></td>
<td>8 (88%)</td>
<td>1 (11%)</td>
<td>1 (11%)</td>
</tr>
<tr>
<td></td>
<td>6 (75%)</td>
<td>2 (25%)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>9 (75%)</td>
<td>2 (17%)</td>
<td>1 (8%)</td>
</tr>
</tbody>
</table>

### Height-for-age percentiles, n (%)

<table>
<thead>
<tr>
<th>Percentile</th>
<th>&lt; 5th (short)</th>
<th>≥ 5th to &lt; 85th (average)</th>
<th>≥ 85th (tall)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 (7%)</td>
<td>61 (84%)</td>
<td>7 (10%)</td>
</tr>
<tr>
<td></td>
<td>15 (25%)</td>
<td>44 (73%)</td>
<td>1 (2%)</td>
</tr>
<tr>
<td></td>
<td>6 (8%)</td>
<td>59 (83%)</td>
<td>6 (8%)</td>
</tr>
<tr>
<td></td>
<td>41 (43%)</td>
<td>55 (52%)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>8 (89%)</td>
<td>1 (11%)</td>
</tr>
<tr>
<td></td>
<td>5 (63%)</td>
<td>3 (37%)</td>
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</tr>
<tr>
<td></td>
<td>3 (25%)</td>
<td>9 (75%)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3 (50%)</td>
<td>3 (50%)</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note.* Younger children were 9-13 years old and older children were 14-18 years old. BMI = Body mass index. For anthropometric measures, one way ANOVA was computed to know whether significant differences existed within mean weight, height, and BMI for children born in United States versus those born in Thailand/Laos. Post Hoc Tukey HSD was computed to know which specific means were significantly different from each other.

*For a specific age group and gender, asterisk indicates significant difference in means between children born in United States and those born in Thailand or Laos, \(p < .05\).
Table 2

Means and Standard Deviations for Perceived body, Ideal body, and Body Dissatisfaction Scores

<table>
<thead>
<tr>
<th>Silhouette chosen</th>
<th>Body dissatisfaction score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Perceived body</td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
</tr>
</tbody>
</table>

Age groups

Boys

9 to 13 years  
4.71 (1.20)  
4.02 (0.91)  
1.11 (1.02)<sup>a</sup>

14 to 18 years  
5.13 (1.44)  
4.74 (0.82)  
1.02 (1.11)<sup>a</sup>

Girls

9 to 13 years  
4.35 (1.10)  
3.52 (1.10)  
1.21 (1.04)<sup>a</sup>

14 to 18 years  
4.88 (1.15)  
3.94 (1.12)  
1.14 (1.02)<sup>a</sup>

Body mass index percentiles

≥ 5<sup>th</sup> to < 85<sup>th</sup> (healthy)  
4.13 (1.01)  
3.83 (1.12)  
0.96 (0.84)<sup>a</sup>

≥ 85<sup>th</sup> to < 95<sup>th</sup> (overweight)  
5.15 (0.81)  
3.82 (0.95)  
1.34 (0.86)<sup>a</sup>

≥ 95<sup>th</sup> (obese)  
5.75 (0.92)  
4.45 (0.95)  
1.44 (1.03)<sup>b</sup>
Height-for-age percentiles

<table>
<thead>
<tr>
<th>Category</th>
<th>BMI</th>
<th>Ideal BMI</th>
<th>Body Dissatisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5&lt;sup&gt;th&lt;/sup&gt; (short)</td>
<td>4.82 (1.23)</td>
<td>4.14 (1.02)</td>
<td>1.02 (0.93)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>≥ 5&lt;sup&gt;th&lt;/sup&gt; to &lt; 85&lt;sup&gt;th&lt;/sup&gt; (average)</td>
<td>4.74 (1.22)</td>
<td>3.92 (1.01)</td>
<td>1.10 (0.90)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>≥ 85&lt;sup&gt;th&lt;/sup&gt; (tall)</td>
<td>5.43 (1.53)</td>
<td>4.33 (0.82)</td>
<td>1.42 (1.24)&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

*Note.* BMI = Body mass index. Significant differences were found between mean perceived and mean ideal body silhouette within gender-specific age groups, BMI-for-age percentile categories, and height-for-age percentile categories at *p* < .05.

Body dissatisfaction score was calculated by the absolute difference between perceived body and ideal body.

<sup>a,b</sup> Different superscripts in Body dissatisfaction score column indicate significant differences in body dissatisfaction scores within age groups, BMI-for-age percentile categories, and height-for-age percentile categories at *p* < .05.
<table>
<thead>
<tr>
<th></th>
<th>Weight difference</th>
<th>Height difference</th>
<th>BMI difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boys</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 to 13 years</td>
<td>-3.10 (6.52)*</td>
<td>-1.41 (6.10)</td>
<td>0.21 (6.04)</td>
</tr>
<tr>
<td>14 to 18 years</td>
<td>-1.33 (8.34)</td>
<td>1.30 (3.41)*</td>
<td>-0.62 (3.74)</td>
</tr>
<tr>
<td><strong>Girls</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 to 13 years</td>
<td>-2.92 (7.10)*</td>
<td>1.24 (5.40)</td>
<td>-0.10 (6.01)</td>
</tr>
<tr>
<td>14 to 18 years</td>
<td>-1.63 (4.84)*</td>
<td>1.32 (2.72)*</td>
<td>-1.14 (2.40)*</td>
</tr>
<tr>
<td>Body mass index percentiles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 5th to &lt; 85th (healthy)</td>
<td>-0.30 (5.23)</td>
<td>0.52 (10.33)</td>
<td>0.50 (4.34)</td>
</tr>
<tr>
<td>Percentile Range</td>
<td>Height Difference</td>
<td>Weight Difference</td>
<td>BMI Difference</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>≥ 85&lt;sup&gt;th&lt;/sup&gt; to &lt; 95&lt;sup&gt;th&lt;/sup&gt; (overweight)</td>
<td>-2.23 (3.84)*</td>
<td>-2.02 (12.71)</td>
<td>0.14 (4.42)</td>
</tr>
<tr>
<td>≥ 95&lt;sup&gt;th&lt;/sup&gt; (obese)</td>
<td>-5.33 (8.61)*</td>
<td>0.44 (7.34)</td>
<td>-2.34 (5.02)*</td>
</tr>
</tbody>
</table>

**Height-for-age percentiles**

<table>
<thead>
<tr>
<th>Percentile Range</th>
<th>Height Difference</th>
<th>Weight Difference</th>
<th>BMI Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5&lt;sup&gt;th&lt;/sup&gt; (short)</td>
<td>-1.52 (4.34)*</td>
<td>0.50 (5.61)</td>
<td>-0.34 (4.12)</td>
</tr>
<tr>
<td>≥ 5&lt;sup&gt;th&lt;/sup&gt; to &lt; 85&lt;sup&gt;th&lt;/sup&gt; (average)</td>
<td>-2.14 (7.01)*</td>
<td>0.14 (10.31)</td>
<td>-0.40 (4.74)</td>
</tr>
<tr>
<td>≥ 85&lt;sup&gt;th&lt;/sup&gt; (tall)</td>
<td>-5.91 (10.01)*</td>
<td>0.43 (17.62)</td>
<td>-1.52 (6.81)</td>
</tr>
</tbody>
</table>

* *p < .05.
Figure Caption

*Figure 1.* Silhouette instrument used to assess body dissatisfaction among Hmong children.
CHAPTER 3

Investigating Health and Diabetes Perceptions among Hmong American children, 9-18 years of age.

Authors: Urvashi Mulasi-Pokhriyal; Chery Smith, PhD, MPH, RD

*Journal of Immigrant and Minority Health*

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**Background:** After immigrating to the United States (US), obesity and diabetes have increased among the Hmong. Therefore, this study investigated how Hmong children perceive health and diabetes risk so that appropriate interventions may be planned.

**Methods:** Hmong children (N = 335), ages 9–18 years participated in this study. A survey used Social Cognitive Theory (SCT) as the theoretical framework and silhouette drawing instrument. Heights and weights were measured and body mass indexes (BMIs) were calculated.

**Results:** About half of the children were either overweight (BMI ≥ 85th < 95th percentile) or obese (BMI ≥ 95th percentile). About 75% chose average sized silhouettes as healthiest and heaviest silhouettes as diabetic shape. Environmental influences including food availability, parents, and media influenced children’s health perceptions.

**Discussion:** Results suggest a need for culturally appropriate interventions, aiming towards a child’s environment and educating them about risks associated with obesity and diabetes.

**Keywords:** Hmong, Hmong health perceptions, Asian Americans, Diabetes in Asian youth
INTRODUCTION

With a population of 15 million [1], Asian Americans form one of the prominent minority groups in United States (US). This population constitutes over 30 different ethnic sub-groups [2], including an estimated 200,000 Hmong [3]. After the Vietnam Conflict, many Hmong suffered hardships because of their role in helping the Central Intelligence Agency (CIA), and consequently fled their home country of Laos and most resettled in Thailand, US, France, and Australia [4].

A history of food insecurity experienced by Hmong in Laos and in refugee camps in Thailand post-Vietnam Conflict appear to influence their post-migration dietary behavior. Research suggests that easy availability of high fat foods, accessibility to food assistance programs in the US, and financial security to buy foods contributes to an increased consumption of calories among this population [5,6]. In a sample of Hmong adolescents residing in Minnesota, Stang et al. [7] found that the children were at an increased risk for obesity and unhealthy weight control behaviors, and reported less physical activity when compared with Caucasian adolescents. Reduced physical activity and dietary acculturation has led to an increase in obesity and other chronic diseases such as diabetes, hypertension, stroke, and cancer among the Hmong population [5–11]. Further, after analyzing data from the 2001 Behavioral Risk Factor Surveillance System (BRFSS), McNeely and Boyko [12] found the prevalence of diabetes among Asian Americans 60% higher compared with non-Hispanic White Americans.

Data on risk factors and/or prevalence of obesity and diabetes among Asian American children and youth are limited, so it is difficult to compare Hmong children
with other Asian ethnic sub-groups. However, within the Hmong population, while conducting focus group interviews among Hmong children (9–18 years) in Minnesota, Franzen and Smith [6] found that the number of years lived in US was an important determinant of body mass index (BMI) among Hmong children, and the children born in US were significantly heavier and taller than those born in Thailand/Laos.

With increases in the prevalence of obesity and diabetes among Hmong, it is timely to examine how Hmong children perceive health and diabetes risk so that culturally appropriate interventions can be planned to educate young children about such risks. Therefore, the purpose of this study was to investigate the factors shaping health and diabetes perceptions among Hmong children 9–18 years of age using a survey incorporating Social Cognitive Theory (SCT) as the theoretical framework and a silhouette drawing instrument. Bandura’s SCT [13] incorporates personal, environmental, and behavioral constructs and has been previously used by researchers to investigate factors influencing eating behavior, food choices, and health among children and adolescents [14, 15]. The SCT was selected as the theoretical framework for this project because it helps in identifying factors that influence individual cognition and perception, thereby explaining behavioral choices [13]. Further, SCT can also explain how and why people acquire and maintain certain behavioral patterns over others and therefore provides intervention strategies for change. The inclusion of personal, environmental, and behavioral determinants was desired so the investigators could examine whether internal versus external factors more heavily influence children’s perception of health and
diabetes. To our knowledge, ours is the first study which assesses health and diabetes perceptions among Hmong children, specifically from a cultural perspective.

METHODS

Participants

Hmong children (150 males and 185 females; \( N = 335 \)), ages 9–18 years from Minneapolis/Saint Paul, Minnesota participated in this study. Some children were born or raised in the US (Born-US) and were either 9–13 years old \( (n = 144) \) or 14–18 years old \( (n = 156) \). Some were born or raised in Thailand/Laos (Born-T/L) and had been in the US for \( \leq 5 \) years and were either 9–13 years old \( (n = 21) \) or 14–18 years old \( (n = 14) \). Children were recruited through Hmong newspapers, schools, churches, organizations, and community centers. Informed parental consent/child assent was obtained in advance and the University’s Institutional Review Board approved this study.

Anthropometric measurements

Weight and stature were measured using standard procedures [16], with outer clothing and shoes removed. BMI was calculated as weight (kg)/height (m)\(^2\) and plotted on the Centers for Disease Control and Prevention (CDC) BMI-for-age gender specific growth charts to obtain a percentile, ranking underweight children as \(< 5^{th} \) percentile, healthy weight as \(5^{th} \) to \(< 85^{th} \) percentile, overweight as \(85^{th} \) to \(< 95^{th} \) percentile and obese children as \(\geq 95^{th} \) percentile [17]. Stature rankings were \(< 5^{th} \) percentile for short, \( \geq 5^{th} \) to \(< 85^{th} \) percentile for average, and \(\geq 85^{th} \) percentile for tall children.
Health and diabetes perceptions

Survey

A validated survey, using Bandura’s SCT [13] as the theoretical framework was developed to measure factors influencing health and diabetes perception. Before implementation, the survey was pilot-tested with 35 Hmong children, and content and readability were found acceptable by participants. A total of 87 questions were asked, with 40 assessing personal, 34 assessing environmental, and 13 assessing behavioral constructs. The personal construct included questions assessing outcome expectancies, personal reinforcements, and self-efficacy, the environmental construct included a child’s social and physical environment, while the behavioral construct included questions assessing a child’s behavioral capability and expectations. The cronbach alpha coefficient was 0.92 for personal, 0.87 for environmental, and 0.83 for behavioral constructs, suggesting an almost perfect reliability level [18]. Sample questions were, (a) If I eat too much rice, I will increase my chances of getting diabetes when I am older (personal), (b) When living in Minnesota, I eat a lot of chips, candy, and pop (environmental), and, (c) I drink milk because it is an important part of my diet (behavioral). The questions were evaluated using a five point (strongly disagree (-2), disagree (-1), unsure (0), agree (+1), strongly agree (+2)) psychometric Likert scale.

Silhouette analysis

A gender-specific eight figure silhouette drawing instrument was administered to children with silhouette 1 being the thinnest and silhouette 8 being the heaviest (Fig. 1). Previous research has suggested strong test–retest reliability after using such an
instrument among children and adolescents [19, 20]. Because no such instrument exists for Hmong children, we pre-tested an existing silhouette instrument [21] with 35 Hmong children for understandability and acceptability, and all children could relate to it. Silhouette questions were modified to read; (a) Circle the boy/girl that is the healthiest (healthy body shape) and (b) Circle the boy/girl that might get diabetes (diabetic body shape).

Data analysis

Data were analyzed and checked for normality using the Statistical Package for the Social Sciences (SPSS version 17; Chicago, IL) software. Descriptive statistics computed means, standard deviations, frequencies, and percent responses. One-way analysis of variance (ANOVA) with Post Hoc Tukey Honestly Significant Differences (HSD) analyzed means for anthropometric measurements (weight, height, and BMI), height for age percentiles, and BMI percentiles by age groups within gender (Table-1). Independent samples t-test was used to find differences in silhouette selection within healthy or diabetic body shape by gender, age groups, birth location, and BMI percentile categories (Table-2). Unit-weighted composite scores were calculated by averaging the responses to survey questions pertaining to children’s health and diabetes perceptions. Two-way analysis of variance (ANOVA) was used to compare the mean personal, environmental, and behavioral scores for gender and age groups, birth location, and BMI percentile categories (Table-3). The associations among the three SCT constructs were investigated by Pearson correlation. Because children’s health and diabetes perceptions were mostly shaped through environmental influences, stepwise regression further
identified environmental variables most predictive of these influences (Table-4).

Significance level was set at p < 0.05 for all data.

RESULTS

Participant characteristics

Mean age of participants was 13.6 ± 2.6 years and majority of them attended high school followed by middle and elementary schools (Table 1). Sixteen percent of the children were overweight (BMI ≥ 85th < 95th percentile) and 30% were obese (BMI ≥ 95th percentile) for their ages. Furthermore, 23% were short-statured (height for age < 5th percentile) and 4% were tall for their ages (height for age ≥ 85th percentile).

Silhouette analysis

Children selected smaller silhouette sizes to depict the healthy body size than they did for the diabetic body size (Table 2). Compared with males, females chose a significantly smaller silhouette for both the healthy and diabetic body shapes. Similarly, younger children chose a significantly smaller silhouette for healthy and diabetic body shape compared with older children. None of the Born-T/L children chose either of the heaviest silhouettes (size 7 or 8) as healthy, while 2% of the Born-US children found these silhouettes healthy. Significant differences were found between Born-T/L and Born-US children for their selection of diabetic body shape, with 32% percent of Born-T/L children choosing the thinnest silhouettes for diabetic body size (sizes 1-3), compared to 7% of the Born-US children finding the same silhouettes diabetic. About three-fourths of all children chose average silhouettes (sizes 4 and 5) most likely to be the healthiest and chose the heaviest silhouettes (sizes 7 and 8) as the diabetic body shape.
SCT analysis

The associations among personal, environmental, and behavioral constructs were positive and significant with correlation coefficients ranging from 0.41 to 0.48, suggesting this is a robust model. The mean composite scores for environmental influences (0.59±0.38) were significantly higher (p < 0.05) than either personal (0.43±0.26) or behavioral influences (0.50±0.44) (Table 3). Our quantitative analysis revealed that environmental influences contributed more to Hmong children’s health and diabetes perceptions than either personal or behavioral influences and because of word limitations we will focus on environmental factors in this manuscript, rather than comparatively less influential personal and behavioral factors.

A stepwise regression analysis of the environmental construct score as a dependent variable and the 34 environmental questions as independent variables revealed statements most predictive of the variance in environmental score (Table 4). Four statements accounted for 62% of the variance in the model and included, “When I see my parents eat a lot, I do too” (R² = 0.32; R² change = 0.32), “I cannot lose weight because there is too much food to eat” (R² = 0.46), “When living in Minnesota, I eat a lot of chips, candy and, pop” (R² = 0.54), and “I think I should be thinner because the people on TV are thin” (R² = 0.62). These suggest that parental modeling, easy access to junk food, and media are important environmental factors influencing Hmong children’s eating behavior and consequently their perception of health.
DISCUSSION

The results from our study indicate that most Hmong children associate a heavier body size with diabetes risk and an average body size with being healthy. Those recently migrated (B-T/L) also chose thin body types as being diabetic, probably associating this shape with type-1 diabetes. Additionally, environmental factors such as food availability, parents, and media shaped children’s health and diabetes perceptions, suggesting that modifying children’s environment may positively influence their current and/or future health related habits. About 50% of the children in our sample were either overweight or obese. Overweight and obesity during childhood poses a risk for developing chronic diseases such as type-2 diabetes, cardiovascular diseases, and certain types of cancers [22, 23], suggesting that children in our sample may be at risk for developing such conditions now or in their near future.

Health and diabetes perceptions

Our results indicated that most Hmong children seemed cognizant of the negative health consequences associated with excess body weight, and chose an average sized body as being healthy. However, this belief was not entirely reflected in their current health status, as about half of these children were either overweight or obese, implying that either they did not perceive they have weight issues or a disconnection between their health beliefs and related actions. A probable explanation for children’s excess weight could be that with increases in acculturation, Hmong dietary patterns have shifted from a traditional cultural diet to a Western one and this has been associated with increases in BMI [6, 10-11]. Additionally, easy access to poor food choices, sedentary lifestyle, and
limited health literacy further make decisions regarding healthy food choices a challenge [5, 6, 10].

Another plausible explanation for increased body weight among these children could be traced to cultural influences. Because traditional Hmong culture associates a heavier body size with strength and health and a thinner body size with fragility and disease [5,10], it is probable that despite Western emphasis on a thinner body frame, some parents and grandparents are encouraging their children to eat more, and children may be receiving positive reinforcements and may be even pressured from their elders to consume more food. Therefore, dueling cultural norms in regard to health and ideal body weight might create intergenerational conflicts between younger and older Hmong generations. Previous research among Asian Americans has indicated that differences between parental and child perceptions regarding acculturation, cultural values, beliefs, and attitudes might result in eating disorders, depressive symptoms, psychological distress, mental health problems, and even suicides among Asian American youth [24-27]. Similarly, our results suggest the possibility of dueling cultural norms regarding food intake and health between Hmong parents and their children, suggesting that the children in our study might be at risk for developing negative health outcomes such as eating disorders and mental health problems due to parental and/or peer pressures.

Most children in our sample, including those who were overweight/obese, associated a heavier body shape with diabetes, indicating knowledge about type-2 or obesity dependent diabetes. Knowledge and education about diabetes and its risks is specifically important among Asians because of a higher susceptibility of this group to
getting diabetes. Chan and colleagues [28] indicate that due to genetic susceptibility to insulin resistance and/or abdominal obesity, the risk for type-2 diabetes among Asians starts at a lower BMI. Therefore, early diabetes education among children could reduce the risk of the disease and its associated problems such as myocardial infarction, stroke, renal failure, blindness, and neuropathy in their future [29, 30].

**Environment as a health determinant**

Our results found that major determinants of children’s health and diabetes perceptions were environmental influences. The term ‘environment’ refers to an objective notion of all the factors that can affect a person’s behavior but are physically external to that person [13]. We investigated a child’s social environment, which included family members, friends, and peers and physical environment which included household environment, school, food outlets, stores, and media as some of the possible determinants in shaping health perceptions among Hmong children.

Within the environmental construct, our analysis found that observational learning of parental eating behavior had most impact in shaping children’s health perceptions, and children reported mimicking their parent’s eating behaviors, especially eating more food after seeing that their parents ate more (Table 4). Children also agreed to not eating vegetables after seeing their families not eating vegetables (Table 4). Research has indicated similarities in children’s eating behavior, food related knowledge and preferences to their parents [31,32]. Although imitating poor parental dietary habits perhaps explains why children in our sample are overweight/obese, it also provides opportunities for change. Fisher and colleagues [32] found that while parental pressures
to consume more fruits and vegetables discouraged consumption of such foods by their daughters, positive parental modeling by consuming such foods themselves resulted in their daughters consuming these foods. While it is unclear whether the same will apply to Hmong children, our results suggest that interventions aiming for changing health behaviors could focus on improving parental dietary intake and feeding practices.

Apart from parental influences, children’s physical environment such as household and school environment, food outlets, and media also influenced their food choice. For example, easy availability of foods such as chips, candy, and soda resulted in children consuming such foods. Research has suggested that modifying children’s environment can have positive influence on their diet; for example, increasing the availability of healthy food items such as fruits, vegetables, and dairy within home is likely to increase the intake of such foods among youth as well as their families [33,34]. Further, school environment needs attention as well because 35% to 40% of youths’ total daily energy is consumed at school [35]. In particular, vending machines and other foods sold à la carte in the school environment are usually higher in fats and sugars and have no federal nutritional guidelines to follow unlike the school lunch program [35]. Children in the present study identified school as a source of non-Hmong food items such as sodas, chips, and candy suggesting that school foodservice is an important environment influencing children’s daily food options and/or choices.

While availability of nutrient dense foods increases the likelihood of their consumption, educating Hmong children about the benefits of such foods and making children aware of such foods in their environment might also encourage healthier
lifestyle. Other strategies could involve revising school lunch policies specifically in regard to the kinds of foods available in vending machines and implementing stronger physical education programs, and within the community, create more playground spaces to increase energy expenditure among Hmong children.

Our survey analysis also found that Hmong children idealized thinner media images among themselves after seeing similar body shapes on TV (Table 4). Media’s influence has been known to cause disordered eating behaviors, lowered self-esteem, and obesity among children [36-38]. Therefore, parents and schools may want to adopt media literacy, educating children not to internalize unattainable images and negative health behaviors as seen on TV.

Although our quantitative analysis incorporating SCT revealed environment to be the most influential construct in shaping Hmong children’s health perceptions, SCT also incorporates reciprocal determinism, where a personal, behavioral, and environmental factors all interact and influence change [13]. A child’s preference and knowledge may also impact their perception, but according to our model, to a lesser extent.

CONCLUSION

The results from this study indicate that Hmong children have an understanding that average sized body is the healthiest. However, overweight and obesity were high in our group and Asian ancestry places them at higher risk to develop diseases such as diabetes, suggesting a need to start nutrition education and weight gain prevention programs with this population. Further, belonging to an ethnic minority, cultural discrepancies’ regarding what is considered healthy, limited health literacy, and health
disparities emphasize a need to implement culturally and linguistically appropriate programs aimed at modifying a child’s environment and educating children about making healthier food choices.
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between parental report of the home food environment and adolescent intakes of

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Satisfaction/Dissatisfaction among Hmong American Children 9-18 years of age
Table I. Sample characteristics of Hmong children (N = 335).

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age groups</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9-13 yrs (n = 82)</td>
<td>14-18 yrs (n = 68)</td>
<td></td>
</tr>
<tr>
<td>9-13 yrs (n = 83)</td>
<td>14-18 yrs (n = 102)</td>
<td></td>
</tr>
<tr>
<td><strong>Age; Mean (SD)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>Females</td>
<td></td>
</tr>
<tr>
<td>11.4 (1.3)</td>
<td>15.7 (1.4)</td>
<td></td>
</tr>
<tr>
<td>11.2 (1.3)</td>
<td>15.8 (1.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Grade level; n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 (39%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>37 (45%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Middle school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 (61%)</td>
<td>8 (12%)</td>
<td></td>
</tr>
<tr>
<td>46 (55%)</td>
<td>9 (9%)</td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 (0%)</td>
<td>59 (87%)</td>
<td></td>
</tr>
<tr>
<td>0 (0%)</td>
<td>92 (90%)</td>
<td></td>
</tr>
<tr>
<td>Post-secondary</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 (0%)</td>
<td>1 (1%)</td>
<td></td>
</tr>
<tr>
<td>0 (0%)</td>
<td>1 (1%)</td>
<td></td>
</tr>
<tr>
<td><strong>Birth location; n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Born-United States</td>
<td></td>
<td></td>
</tr>
<tr>
<td>73 (89%)</td>
<td>60 (88%)</td>
<td></td>
</tr>
<tr>
<td>71 (85%)</td>
<td>96 (94%)</td>
<td></td>
</tr>
<tr>
<td>Born-Thailand/Laos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 (11%)</td>
<td>8 (12%)</td>
<td></td>
</tr>
<tr>
<td>12 (14%)</td>
<td>6 (6%)</td>
<td></td>
</tr>
<tr>
<td><strong>Anthropometric measurements; Mean (SD)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>48.3 (18)a</td>
<td>68.1 (18)b</td>
</tr>
<tr>
<td></td>
<td>44.8 (14)a</td>
<td>58.6 (13)c</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>145 (11)a</td>
<td>163 (7)b</td>
</tr>
<tr>
<td></td>
<td>144 (9)a</td>
<td>153 (5)c</td>
</tr>
<tr>
<td>Body Mass Index (kg/m²)</td>
<td>22.4 (5)ab</td>
<td>25.5 (6)a</td>
</tr>
<tr>
<td></td>
<td>21.3 (5)b</td>
<td>25.0 (6)c</td>
</tr>
<tr>
<td><strong>Height for age percentiles; n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 5th percentile (short)</td>
<td>5 (6%)</td>
<td>20 (29%)</td>
</tr>
<tr>
<td></td>
<td>9 (11%)</td>
<td>44 (43%)</td>
</tr>
<tr>
<td>≥ 5th to &lt; 85th percentile (average)</td>
<td>69 (84%)</td>
<td>47 (69%)</td>
</tr>
<tr>
<td></td>
<td>68 (82%)</td>
<td>58 (57%)</td>
</tr>
<tr>
<td>Body mass index percentiles; n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>≥ 5th to &lt; 85th percentile (healthy)</td>
<td>40 (49%)</td>
<td>31 (46%)</td>
</tr>
<tr>
<td>≥ 85th to &lt; 95th percentile (overweight)</td>
<td>12 (15%)</td>
<td>10 (15%)</td>
</tr>
<tr>
<td>≥ 95th percentile (obese)</td>
<td>31 (38%)</td>
<td>26 (38%)</td>
</tr>
</tbody>
</table>

* Different superscripts across indicate significant difference of means at p < 0.05

A One way ANOVA computed to know whether significant differences exist between means.

B Post Hoc Tukey HSD test computed to know which means are significantly different from each other.
Table II. Mean (SD) silhouette selected for healthy and diabetic body.

<table>
<thead>
<tr>
<th></th>
<th>Healthy body</th>
<th>Diabetic body</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>4.15 (1.21)a</td>
<td>6.65 (2.07)a</td>
</tr>
<tr>
<td>Males</td>
<td>4.50 (1.26)b</td>
<td>7.14 (1.70)b</td>
</tr>
<tr>
<td><strong>Age groups</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 to 13 years</td>
<td>4.02 (1.41)a</td>
<td>6.62 (2.13)a</td>
</tr>
<tr>
<td>14 to 18 years</td>
<td>4.57 (1.00)b</td>
<td>7.10 (1.68)b</td>
</tr>
<tr>
<td><strong>Birth location</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Born-United States</td>
<td>4.29 (1.24)a</td>
<td>7.07 (1.70)a</td>
</tr>
<tr>
<td>Born-Thailand/Laos</td>
<td>4.40 (1.36)a</td>
<td>5.14 (2.79)b</td>
</tr>
<tr>
<td><strong>Body mass index percentiles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 5th to &lt; 85th percentile</td>
<td>4.38 (1.28)a</td>
<td>6.59 (2.10)a</td>
</tr>
<tr>
<td>≥ 85th to &lt; 95th percentile</td>
<td>4.09 (1.13)a</td>
<td>6.92 (2.02)b</td>
</tr>
<tr>
<td>≥ 95th percentile</td>
<td>4.28 (1.25)a</td>
<td>7.33 (1.34)b</td>
</tr>
</tbody>
</table>

a,b Different superscripts for each category (by gender, age groups, birth location, and body mass index percentiles) in the column for diabetic body or healthy body indicate significant difference of means at p < 0.05.
Table III. Mean (SD) composite scores for personal, environmental, and behavioral constructs.

<table>
<thead>
<tr>
<th></th>
<th>Personal</th>
<th>Environmental</th>
<th>Behavioral</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong></td>
<td>0.43 (0.26)a</td>
<td>0.59 (0.38)b</td>
<td>0.50 (0.44)c</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>0.44 (0.25)a</td>
<td>0.56 (0.36)b</td>
<td>0.47 (0.45)a</td>
</tr>
<tr>
<td>Males</td>
<td>0.42 (0.28)a</td>
<td>0.62 (0.40)b</td>
<td>0.54 (0.43)c</td>
</tr>
<tr>
<td><strong>Age groups</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 to 13 years</td>
<td>0.38 (0.25)a</td>
<td>0.55 (0.41)b</td>
<td>0.42 (0.39)a</td>
</tr>
<tr>
<td>14 to 18 years</td>
<td>0.49 (0.26)a</td>
<td>0.63 (0.35)b</td>
<td>0.58 (0.47)b</td>
</tr>
<tr>
<td><strong>Birth location</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Born-United States</td>
<td>0.44 (0.26)a</td>
<td>0.60 (0.37)b</td>
<td>0.52 (0.44)c</td>
</tr>
<tr>
<td>Born-Thailand/Laos</td>
<td>0.36 (0.27)a</td>
<td>0.45 (0.46)b</td>
<td>0.28 (0.33)a</td>
</tr>
<tr>
<td><strong>Body mass index percentiles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 5th to &lt; 85th percentile</td>
<td>0.44 (0.25)a</td>
<td>0.58 (0.39)b</td>
<td>0.52 (0.43)c</td>
</tr>
<tr>
<td>≥ 85th to &lt; 95th percentile</td>
<td>0.45 (0.26)a</td>
<td>0.58 (0.38)b</td>
<td>0.43 (0.41)a</td>
</tr>
<tr>
<td>≥ 95th percentile</td>
<td>0.40 (0.28)a</td>
<td>0.63 (0.36)b</td>
<td>0.50 (0.46)c</td>
</tr>
</tbody>
</table>

\(a, b, c\) Different superscripts across indicate significant difference of means at \(p < 0.05\).
**Table IV:** Stepwise regression analyses of the environmental construct.

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>Standard error</th>
<th>$R^2$</th>
<th>$R^2$ change</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable: Environment composite</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When I see my parents eat a lot, I do too</td>
<td>.043</td>
<td>.001</td>
<td>0.32</td>
<td>0.32</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>I cannot lose weight because there is too much food to eat</td>
<td>.031</td>
<td>.001</td>
<td>0.46</td>
<td>0.14</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>When living in Minnesota, I eat a lot of chips, candy and, pop</td>
<td>.030</td>
<td>.001</td>
<td>0.54</td>
<td>0.08</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>I think I should be thinner because the people on TV are thin</td>
<td>.032</td>
<td>.002</td>
<td>0.62</td>
<td>0.07</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>I do not eat vegetables because my family does not eat them</td>
<td>.031</td>
<td>.002</td>
<td>0.72</td>
<td>0.05</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>I gain weight because there is always food to eat</td>
<td>.028</td>
<td>.001</td>
<td>0.78</td>
<td>0.02</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>When I see chips, candy, or pop on TV I ask my mom or dad if we can buy it</td>
<td>.028</td>
<td>.001</td>
<td>0.80</td>
<td>0.02</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>
Figure 1. Silhouette instrument used to assess health and diabetes perceptions among Hmong children. (Adapted from Stevens et al. (1999))

On separate gender-specific forms girls and boys were asked to a) circle the boy/girl that is the healthiest (healthy body shape), and with a second set of silhouettes b) circle the boy/girl that might get diabetes (diabetic body shape).
CHAPTER 4

Investigating dietary acculturation and intake among US born and Thailand/Laos born Hmong American children, 9-18 years

Authors: Urvashi Mulasi-Pokhriyal; Chery Smith, PhD, MPH, RD; Lisa Franzen-Castle, PhD, RD

Public Health Nutrition, revised, under second review.
**Background:** The Hmong are a growing population of Southeast Asian immigrants with increasing rates of obesity and diabetes, yet little is known about their dietary consumption patterns.

**Objective:** To investigate dietary intake of Hmong children and whether acculturation and/or time lived in the United States (US) influences dietary intake, body mass index (BMI), and nutritional status.

**Design:** Two 24-hour dietary recalls were collected on non-consecutive days, using multiple-pass interview method. Heights and weights were measured and BMI was calculated. An acculturation score was computed.

**Setting:** Schools, churches, Hmong organizations, and community centers.

**Subjects:** Three hundred and thirty-five Hmong children ages 9-18 years from Twin Cities, Minnesota, USA.

**Results:** Approximately half of our participants were either overweight or obese. Children who were born in US consumed significantly more calories, carbohydrates, saturated fat, and sodium, and had a significantly higher BMI-for-age than those who were born in Thailand/Laos and had been in the US for 5 years or less. Children who were more acculturated to US norms including language use, social connections, and dietary habits had higher mean BMI and consumed significantly more fats, sodium, and calcium compared with their less acculturated counterparts.

**Conclusions:** Diets of Hmong children are below the recommendations for calcium, iron, vitamin-A, vitamin-D, phosphorus, and fiber, and higher in fats, sugars, and sodium. Living in an obesogenic US environment is a probable reason for poor dietary quality of
Hmong, and may be a contributing factor to the rising rates of obesity and diabetes in this population.
Introduction

According to the United States (US) Census Bureau, over 100 million US residents are now considered to be from a minority group (1). With a population of about 15 million (2), Asian Americans, including the Hmong are one of the fastest growing minority populations in the US. The Hmong, a Southeast Asian group originally from Laos, secretly assisted the US military and Central Intelligence Agency (CIA) during the Vietnamese Conflict (1963-1975) (3). After the Conflict, communists targeted Hmong because of their help to the US and many Hmong suffered hardships including genocide, poverty, excessive labor, depression, and food insecurity, and consequently fled Laos and settled in refugee camps in Thailand (4-8). Conditions of refugee camps varied, but poverty and food insecurity were common, leading Hmong migration to countries such as Australia, France, and the US (4,6,8). Today it is estimated that about 200,000 Hmong live in the US (2). This number is expected to grow because Hmong tend to have larger families; the average family size of Hmong Americans is 6.51 people, much higher compared with 3.14 people in the average US family (9).

Immigration to the US has introduced the once physically active Hmong to an obesogenic American environment. Franzen and Smith (4) found that after immigrating to the US, environmental changes and increased acculturation to American dietary habits have negatively impacted the weight and health status of this population. Increased rates of obesity and obesity related conditions have been noted among the Hmong (4,5, 10-14). In a sample of adult Hmong refugees (n = 448, ages >20 years), Culhane-Pera et al. (12) found that 33% of the sample was overweight and 15% obese. Further, diabetes rates also seem to be rising in this group (15) and among Hmong adults in US, the rate of diabetes is
estimated to be 20 times higher than that of Hmong adults in Thailand\(^\text{(16)}\). Her and Mundt\(^\text{(17)}\) found that among Wisconsin Hmong adults \((n = 144)\), 41% had casual capillary blood glucose levels \(\geq 140\text{ mg/dl}\), considered a positive screen test for diabetes.

Among children, CDC estimated that the rate of obesity dependent type 2 diabetes is greater than type 1 diabetes among Asian/Pacific Islanders younger than 20 years of age\(^\text{(18)}\).

The US environment appears to have influenced Hmong dietary and food related habits. In Laos, traditional Hmong diets were higher in complex carbohydrates, boiled vegetables, and seasonal fruits, and water and vegetable/meat broths were the usual beverages of choice\(^\text{(4, 13)}\). Additionally, desserts were rarely consumed and snacking was atypical\(^\text{(4)}\). After immigration to US, an increased consumption of saturated fats, sugars, refined grains, and salt has been noted among the Hmong\(^\text{(4, 5, 13)}\).

Little is known about the dietary intake of Hmong adults or children at the nutrient level. In focus group discussions, dietary behaviors and acculturation among Hmong children (9-18 years) were explored, but individual dietary intake was not assessed\(^\text{(5)}\). Vue and Reicks\(^\text{(19)}\) assessed intake of calcium rich foods and beverages among 10-13 year old Hmong girls through questionnaires and parental interviews but did not collect dietary data on other nutrients/food groups.

To our knowledge, comprehensive dietary intake and BMI status for school-aged Hmong children has not been studied and research investigating Hmong dietary practices, current nutritional status, and post-migration impact on dietary acculturation is also very limited. Knowing that Hmong are a growing ethnic group in the US and with increasing rates of obesity and diabetes in this group, it is timely to investigate the dietary
consumption patterns of Hmong children so that appropriate and timely interventions may be planned. Therefore, the purpose of this study was: (a) to investigate whether time lived in the US and the degree of acculturation impacts the quality and quantity of diet, and (b) to assess the differences in food consumption patterns by food groups and nutrient intakes for Hmong children born in the US to those recently immigrated from Thailand or Laos. To the best of our knowledge, ours is the first study which assesses dietary intake among Hmong specifically from an acculturation perspective, incorporating detailed quantitative methodology.

**Experimental methods**

**Participants**

Three hundred and thirty-five Hmong children (aged 9-18 years) living in Minneapolis/Saint Paul, Minnesota (MN) participated in this study. Some children were born and/or raised in the US (Born-US) and were either 9-13 years old ($n = 144$) or 14-18 years old ($n = 156$). A small number were born and/or raised in Thailand/Laos and had been in the US for ≤ 5 years (Born-T/L) and were either 9-13 years old ($n = 21$) or 14-18 years old ($n = 14$). Hmong organizations and key informants assisted in recruitment efforts and in total 17 sites were visited to maximize diversity within the sample. Children were recruited through activity-based organizations (54%), Hmong schools (26%), churches (12%), and via advertisement in the local Hmong newspaper (8%). Informed parental consent/child assent was obtained and the University’s Institutional Review Board approved this study.
**Dietary recall methodology**

Two 24-hour dietary recalls were collected by trained researchers on nonconsecutive days (30% of the recalls included a weekend day) and averaged in order to better describe each child’s usual intake of food and nutrients. While interviewing children, a four stage, multiple-pass technique was used (20). In the first stage, a complete list of all foods and beverages consumed by the child was obtained, followed by a detailed description of each food and beverage consumed (stage 2). Further, cooking methods and food brand names were also asked. An estimated amount of each food and beverage item consumed was obtained in stage 3. Lastly, in stage 4, the recall was reviewed by the researcher with the child to ensure that all items, including vitamins and mineral supplementation had been recorded. While the 24-hour recall has limitations for individual assessment, it can be useful in comparing groups (21). To evaluate dietary assessment methods used among 5-18 year olds, McPherson et al. (22) examined 38 validity and 9 reliability studies. Correlations between the dietary method and the validation standard were higher for 24-hour recalls and food records methodologies than for food frequency questionnaires. Furthermore, Frank (23) suggested the 24-hour recall method to be a reliable tool for ages 9 years and above.

In addition to using the multiple-pass interviewing technique, memory prompts such as colorful food models, measuring cups, and food pictures were used as aids to reduce error, improve the quality and accuracy of the intake, and to provide children with models to estimate portion sizes. Food models included foods consumed in both Hmong and American cultures such as rice, stir-fries, soups, bread, milk, pizza, and cereal.
**Acculturation score**

Acculturation level was assessed using ten questions asking about language use, social connections, and overall dietary habits. The acculturation tool used in this project was previously created by Marin *et al.* (24) for Hispanics, and has reliability-validity coefficients comparable to other published acculturation tools (5). The tool was first used successfully with Hmong adults (4). Prior to using the tool with the larger group of children, it was pilot-tested and assessed for ease of use and readability with 22 Hmong children, and children reported no difficulties with the tool (Flesch Reading ease was 84.3 and Flesch-Kincaid readability was grade level 4.1). To measure the reliability of the acculturation tool, children completed the same acculturation assessment at two different times. Paired samples *t*-tests were then computed to determine whether there were significant differences in children’s responses between the two assessments, and no significant differences were found, suggesting that this was an appropriate tool for children. Acculturation score was determined by summing the responses to individual questions and a higher score indicated more acculturation to US norms. Sample questions were, (a) What language do you usually speak at home? (b) Your closest friends are? (c) I eat _____ foods. Possible responses to these questions were (a) Only Hmong, (b) More Hmong than American, (c) Both Hmong and American, (d) More American than Hmong, and (e) Only American.

**Anthropometric measures**

Heights and weights were measured using standard procedures (25) without outer heavier clothing and shoes. Body mass index (BMI) was calculated as weight (kg)/height
(m)^2 and plotted on the Centers for Disease Control and Prevention (CDC) BMI-for-age gender specific growth charts to obtain a percentile, which ranks underweight children as < 5th percentile, healthy weight as 5th to < 85th percentile, overweight as 85th to < 95th percentile and obese children as ≥ 95th percentile. Stature rankings were < 5th percentile for short, 5th to < 85th percentile for average, and ≥ 85th percentile for tall children.

Data analysis

Data were first checked for normality and analyzed using the Predictive Analytics SoftWare (PASW version 17; 2009). Descriptive statistics computed means, standard deviations, and frequencies (Table 1). The 24-hour recalls were analyzed using the ESHA Food Processor® SQL Software (Version 10.4.0; 2009), which computed nutrient and MyPyramid intake. The 2010 Dietary Reference Intakes (DRIs) were used as a reference for each nutrient recommended within a specific age group (9-13 years and 14-18 years) and gender (27) (Tables 2 and 3). MyPyramid guidelines were used to compute grains, vegetables, fruits, milk, meat and beans, and fats, oils, and sweet servings (28, 29). A serving of fat was the number of grams in 1 tbsp of fat for butter, margarine, oils, and shortening (28, 29). For meats, an additional fat serving was reported as a multiple of the fat standard for the specific meat, and for milk products and mixed foods, an additional fat serving was reported as a multiple of 12.8 grams, the weight of 1 tbsp of shortening (29). A serving of sugar was defined as the number of grams in 1 tsp of sugar (4 g) (28, 29). The results from 24-hour data and MyPyramid analysis were then imported into PASW (Version 17; 2009) for further analysis. Per MyPyramid guidelines (30), children < 12 years of age have lower serving suggestions for fruits and meat and beans than older
children, and were therefore compared separately (Table 4). Independent samples $t$-test was used to compare differences in nutrients and food group intake between children born in US versus those born in Thailand/Laos. The associations among years lived in US, acculturation scores, BMI, and nutrients consumed were calculated by Pearson correlation ($r$). The significance level was set at $P < 0.05$.

**Results**

**Sample characteristics**

Sample characteristics of Hmong children are shown in Table 1. Mean age of study participants was 13.6 (SD 2.6) years. About 45.1% attended high school, 33.7% middle school, and 20.6% elementary schools. Sixteen percent of the children were overweight (BMI-for-age $\geq 85^{th} < 95^{th}$ percentile) and 30% were obese (BMI-for-age $\geq 95^{th}$ percentile) for their ages. Further, 23.3% were short statured (height-for-age $< 5^{th}$ percentile) and 4.5% were tall for their ages (height-for-age $\geq 85^{th}$ percentile). Compared with Born-T/L, Born-US children were significantly heavier ($M_{\text{weight}} = 55.8$ (SD 18.1) kg vs. 44.2 (SD 11.2) kg), taller ($M_{\text{height}} 151.3$ (SD 10.9) cm vs. 146.9 (SD 11.1) cm), and had a higher BMI ($M_{\text{BMI}} = 23.9$ (SD 5.8) kg/m$^2$ vs. 20.2 (SD 3.0) kg/m$^2$) ($P < 0.05$ for all comparisons).

**24-hour dietary recall**

The 24-hour dietary recall results are shown in Tables 2 and 3. The diets of most Born-T/L children were below the Dietary Reference Intake (DRI) levels for fiber, vitamin-D, vitamin-E, calcium, and magnesium. Among most Born-US children, fiber, calcium, vitamin-A, magnesium, and potassium were consumed below the DRI levels.
Among 9-13 year old males, Born-US consumed significantly more calories, carbohydrates, fat, saturated fat, sodium, and fluoride than Born-T/L ones ($P < 0.05$). Among younger females, US born consumed higher amounts of trans-fatty acids and sodium than their Born-T/L counterparts ($P < 0.05$) (Table 2). Approximately one-third of the younger females did not meet DRI recommendations for iron. Among 14-18 year old males, Born-US consumed more calories, carbohydrates, vitamin C, vitamin E, copper, sodium, and fluoride than Born-T/L ones ($P < 0.05$). Further, among older females, those born in US consumed more trans-fatty acid and sodium, and less cholesterol than their Thailand/Laos born counterparts (Table 3). About two-thirds of the older females did not meet DRI recommendations for iron.

**MyPyramid analysis**

MyPyramid analysis indicated that most 9-11 year olds consumed less vegetable and milk than the suggested servings (Table 4). Further, the majority of 12-18 year olds consumed less fruits, vegetables, and milk than recommended. US born males consumed significantly higher amounts of fats, oils, and sweets than Born-T/L males ($P < 0.05$), while no significant differences were observed among females in this regard (Table 4). Among 12-18 year old females, Born-US consumed less fruits than the Born-T/L ones ($P < 0.05$). Among 12-18 year old males, Born-US consumed more grains than the Born-T/L ones ($P < 0.05$).

**Dietary associations**

Among all children, acculturation was positively associated with consumption of carbohydrates ($r = .12, P < 0.05$), grains ($r = .16, P < 0.05$), saturated fat ($r = .13, P < 0.05$), trans-fatty acids ($r = .13, P < 0.05$), calcium ($r = .16, P < 0.01$), and sodium ($r =
.21, \( P < 0.001 \)). Additionally, more acculturated children had a higher BMI-for-age compared with less acculturated ones \( (r = 0.16, \ P < 0.05) \). Likewise, the number of years lived in the US were positively associated with consumption of calories \( (r = .23, \ P < 0.001) \), saturated fat \( (r = 0.18, \ P < 0.05) \), trans-fatty acid \( (r = 0.17, \ P < 0.05) \), fiber \( (r = 0.13, \ P < 0.05) \), sodium \( (r = 0.29, \ P < 0.001) \), and fats, oils, and sweets \( (r = 0.17, \ P < 0.05) \), and BMI-for-age \( (r = 0.39, \ P < 0.001) \). Higher BMI was also associated with a significantly higher consumption of sodium \( (r = 0.16, \ P < 0.05) \), and a significantly lower consumption of fruits \( (r = -0.21, \ P < 0.001) \) and milk \( (r = -0.15, \ P < 0.05) \).

**Discussion**

The results of our study suggest that diets of Hmong children are low in nutrients such as calcium, iron, vitamin-A, vitamin-D, phosphorus, and fiber, and high in sodium, fats, oils, and sweets. This is reflected in low consumption levels of vegetable and milk, and high consumption of energy dense foods. US born children consumed more calories, carbohydrates, saturated fat, and sodium and had a higher BMI than those born in Thailand/Laos (and had been in the US for 5 years or less), suggesting that an obesogenic US environment is a probable reason for poor dietary habits among Hmong children. Additionally, the 24-hour recalls of most US born children included items such as muffins, cakes, chips, soda, chocolate milk, pizza, burgers, and fried meats, and most US born children reported using high sodium sauces as added seasonings (results not shown). Most Thailand/Laos born children consumed boiled meats, cooked vegetables, steamed rice, candy, and cookies (results not shown). No significant differences in rice consumption were noted between the two groups \( \text{Born US } M_{\text{rice}} = 1.2 \ (\text{SD 0.92}) \) cups/day, \( \text{Born-T/L } M_{\text{rice}} = 1.3 \ (\text{SD 0.61}) \) cups/day).
Children who were more acculturated to US norms including language use, social connections, and dietary habits had a higher BMI-for-age compared with their less acculturated counterparts. About half of our participants were either overweight or obese. Research has indicated that obesity during childhood and adolescent years is a risk factor for developing coronary heart disease, hypertension, dyslipidemia, type 2 diabetes, and even results in premature mortality in adulthood\(^{(31,32)}\), suggesting that most Hmong children in our sample may be at a risk for developing such conditions in their near future.

**Dietary status of Hmong children**

More than 90% of the children in our sample did not meet the MyPyramid recommendations for the dairy food group including milk, yogurt, and cheese. This observation is similar to national trends in dairy consumption among children, with more than half of children aged 2-8 years and three-fourths of children aged 9-19 years not consuming recommended dairy servings\(^{(33)}\). Nutrients such as calcium, vitamin D, phosphorus, and proteins are found in the dairy food group and are required to support growth and development during childhood and adolescent years, including reaching peak bone mass. It is believed that about 85–90% of the final adult bone mass is acquired between the ages of 18-20 years\(^{(34)}\), necessitating the inclusion of bone building nutrients during childhood. Possible reasons for low dairy consumption in our sample may be related to high lactose intolerance found among Asians\(^{(35)}\), and not consuming milk because of taste preferences and/or cultural reasons\(^{(36)}\). The inadequate intake of calcium and vitamin D during developmental years may increase the risk for osteoporosis later in life\(^{(37,38)}\). To decrease future cases of osteoporosis, schools should be encouraged
to increase calcium intake among children either by encouraging milk and yogurt consumption among non-lactose intolerant children, or by providing non-dairy fortified foods such as juices, cereals, and grains to those with lactose intolerance.

The mean iron consumption was below the DRI for approximately 67% of the older girls ($M_{\text{iron}} = 13.6$ (SD $8.4$) mg; DRI = 15 mg/day). Similar to our results, NHANES (1999-2000) estimated an average of 13.4 mg/day of iron intake among females 12-19 years $^{39}$. Iron deficiency affects 2.4 million children in the US, and it is one of the most common nutritional deficiencies among menstruating adolescents and women $^{40}$. Iron deficiency limits the delivery of oxygen to cells, resulting in decreased immunity, increased fatigue, poor work performance, and among pregnant women, delivery of low birth weight infants $^{41,42}$. Our results indicated lower consumption levels of iron among Hmong children and oral supplementation might be a potential source of iron for this group. Research suggests that long-term oral iron supplementation can improve cognitive abilities including attention span and the ability to concentrate $^{43,44}$.

The diets of most Hmong children were below the recommendations for fiber and the mean fiber intake was about 10 grams per day. Further, the mean vegetable intake among all children was less than 1 cup per day. Within US, it is estimated that only 39% of children within 2-17 years of age meet the United States Department of Agriculture (USDA) dietary recommendations for fiber $^{45}$. As reported in the literature, Hmong American diets tend to be low in fiber rich foods such as whole grains, fruits, and vegetables, partly because of acculturation to US dietary norms $^{13,46}$. We found no significant differences in fiber consumption between children consuming traditional diets and those consuming more Americanized diets. Franzen and Smith $^{4}$ reported low intake
levels of fruits among Hmong because fruits were considered as luxury items and consumed sparingly, often as a dessert. Also, fruits that were preferred and easily available in Thailand/Laos such as jackfruit, mango, guava, papaya, and pineapple are either hard to find or too expensive to purchase in the US, further decreasing fruit consumption\(^{(13)}\). While a diet rich in fiber has many health benefits such as lowering LDL cholesterol, decreasing the incidence of cardiovascular diseases and diabetes, preventing obesity, limiting total energy intake, and providing other important micronutrients\(^{(47)}\), it will be a challenge to health care professionals to create ways to increase fiber in this Asian subgroup. Our results suggest that Hmong children would benefit from early education about the benefits of fiber and foods rich in fiber, with emphasis on the consumption of whole-grains, fruits, and vegetables. This might be best accomplished at school through the National School Lunch Program (NSLP) by including whole-grain food choices, fresh fruits, and salads in school menu. Further, involving parents in educational and/or physical activity programs with their children could improve activity levels, though this has not been evaluated among Hmong. Parental participation will be important because Hmong parents (specifically the recently immigrated ones) might perceive losing weight as a negative health condition, because being heavy is generally perceived as being beautiful and healthy in traditional Hmong culture\(^{(48)}\). One such intervention could be incorporating gardening projects in the school curricula/community programs with parents and children planting seasonal fruits and vegetables as a family.
Acculturation and dietary intake

Number of years lived in the US and acculturation to US dietary habits was associated with a higher consumption of calories, trans fatty acids, saturated fats, sugars, and sodium, and may partly explain why about half of our sample was overweight/obese. In a sample of low-income Puerto Rican women living in the US, Himmelgreen et al.\textsuperscript{(49)} found significant increases in BMI with the length of time staying in the US. Research also indicates that after immigrating and acculturating to the US environment, sedentary habits, busy lifestyle, and physical inactivity has led to increases in overweight and obesity in the Hmong population\textsuperscript{(4, 5, 13)}. Stang et al.\textsuperscript{(14)} found that when compared with White adolescents, Hmong adolescents reported less physical activity and were at an increased risk for obesity. Most Hmong migrated from areas where they worked hard in farm fields; manual labor was the primary economic source. Post-migration, many Hmong adopted a sedentary lifestyle, and have less time for being physically active\textsuperscript{(4, 50)}. Further, many still associate physical activity with occupation and are usually not interested in exercising during leisure time\textsuperscript{(4)}. Further, Asian Americans appear to be genetically susceptible to develop abdominal obesity and insulin resistance and the risk of type 2 diabetes among Asians starts at a lower BMI\textsuperscript{(51)}, emphasizing the importance of a healthy diet and physical activity among Hmong from an earlier age.

Results from this study also indicate that children who were born in the US consumed significantly more sodium than their Thailand/Laos born counterparts. Research has shown that number of years lived in the US and acculturation to the US dietary patterns is associated with increased sodium consumption and consequently a higher prevalence of hypertension among immigrant populations\textsuperscript{(52)}. Because the
children in our study are in their preadolescent to adolescent years, consuming high sodium diets makes them susceptible to develop hypertension and associated conditions such as cardiovascular diseases if measures to educate them about healthy lifestyle are not taken soon.

**Limitations and Conclusions**

Although our study is the first one to demonstrate a detailed, descriptive quantitative analysis of Hmong diets from an acculturation perspective, nevertheless it has some limitations. Some participants may have under/over reported their food intake. Earlier research has found that overweight/obese respondents, women, and weight-conscious people tend to underreport their food intake because of social desirability, probably leading to respondent bias during data collection (20, 53, 54). Secondly, interviewer bias is a common form of error within 24-hour dietary recalls (20), and some participant dietary information might have been missed, misunderstood, or incorrectly recorded by the researchers. However, we believe that using the multiple-pass interview technique and incorporating memory prompts such as food models, measuring cups/spoons during the interviews minimized this problem. Third, Born-T/L sample was smaller in size than the US born one, making the comparisons between these groups somewhat difficult. However, statistical tests including t-tests adjust for the sample size and some results were found significant while comparing US born children with the Born-T/L ones. Lastly, although we recruited a representative sample of Hmong children in MN, our results cannot be generalized to all Hmong children living in the US. Given that the Hmong are a fast growing Asian ethnic subgroup in the US (2, 55), it is important to learn more about their nutritional status and needs from a health care perspective. Our findings
indicate a higher intake of fats, sweets, and sodium among young Hmong and suggest a need for dietary education and intervention among Hmong children towards eating healthier foods.
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Table 1. Sample characteristics of Hmong children.

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9-13 years</td>
<td>14-18 years</td>
</tr>
<tr>
<td>n</td>
<td>n = 82</td>
<td>n = 68</td>
</tr>
<tr>
<td>Mean</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Age</td>
<td>11.4</td>
<td>1.3</td>
</tr>
<tr>
<td>Weight kg</td>
<td>48.3</td>
<td>18</td>
</tr>
<tr>
<td>Height cm</td>
<td>145</td>
<td>11</td>
</tr>
<tr>
<td>Body Mass Index (kg/m^2)</td>
<td>22.4</td>
<td>5</td>
</tr>
<tr>
<td>Grade level</td>
<td></td>
<td>n %</td>
</tr>
<tr>
<td>Middle school</td>
<td>50</td>
<td>61%</td>
</tr>
<tr>
<td>High school</td>
<td>--</td>
<td>59</td>
</tr>
<tr>
<td>Post-secondary</td>
<td>--</td>
<td>1</td>
</tr>
<tr>
<td>Birth location</td>
<td></td>
<td>n %</td>
</tr>
<tr>
<td>Born-United States (Born-US)</td>
<td>73</td>
<td>89%</td>
</tr>
<tr>
<td>Born-Thailand or Laos (Born-T/L)^a</td>
<td>9</td>
<td>11%</td>
</tr>
<tr>
<td>Height for age percentiles</td>
<td></td>
<td>n %</td>
</tr>
<tr>
<td>&lt; 5th percentile short</td>
<td>5</td>
<td>6%</td>
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</table>

^a Data was not collected for males 14-18 years.
<table>
<thead>
<tr>
<th></th>
<th>69</th>
<th>84%</th>
<th>47</th>
<th>69%</th>
<th>68</th>
<th>82%</th>
<th>58</th>
<th>57%</th>
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<tbody>
<tr>
<td>≥ 5th to &lt; 85th percentile average</td>
<td>8</td>
<td>10%</td>
<td>1</td>
<td>1%</td>
<td>6</td>
<td>7%</td>
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</table>

**Body mass index percentiles**

<table>
<thead>
<tr>
<th></th>
<th>40</th>
<th>49%</th>
<th>31</th>
<th>46%</th>
<th>51</th>
<th>61%</th>
<th>57</th>
<th>56%</th>
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</thead>
<tbody>
<tr>
<td>≥ 5th to &lt; 85th percentile healthy</td>
<td>12</td>
<td>15%</td>
<td>10</td>
<td>15%</td>
<td>14</td>
<td>17%</td>
<td>18</td>
<td>18%</td>
</tr>
<tr>
<td>≥ 85th to &lt; 95th percentile overweight</td>
<td>31</td>
<td>38%</td>
<td>26</td>
<td>38%</td>
<td>18</td>
<td>22%</td>
<td>27</td>
<td>26%</td>
</tr>
<tr>
<td>≥ 95th percentile obese</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*a Children who were born in Thailand or Laos were living in United States for ≤ 5 years.*
Table 2. Dietary intakes by birth location for 9-13 year old Hmong children compared with Dietary Reference Intakes.

<table>
<thead>
<tr>
<th></th>
<th>Males, 9-13 years</th>
<th>Females, 9-13 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Born Thailand/Laos</td>
<td>Born United States</td>
</tr>
<tr>
<td></td>
<td>B-T/L</td>
<td>B-US</td>
</tr>
<tr>
<td></td>
<td>n = 82</td>
<td></td>
</tr>
<tr>
<td>Acculturation Score</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>DRIs</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Mean</td>
<td>19.5</td>
<td>5.5*</td>
</tr>
<tr>
<td>SD</td>
<td>1354.5</td>
<td>300*</td>
</tr>
<tr>
<td>Calories kcal/d&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2071</td>
<td>1536.5</td>
</tr>
<tr>
<td>Carbohydrates g/d</td>
<td>34</td>
<td>72.1</td>
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<tr>
<td>Protein g/d</td>
<td>130</td>
<td>168.5</td>
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<tr>
<td>Fat g/d</td>
<td>130</td>
<td>1712.3</td>
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<tr>
<td>Saturated Fat g/d</td>
<td>130</td>
<td>197.6</td>
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<tr>
<td>Trans Fatty Acid g/d</td>
<td>130</td>
<td>198.4</td>
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<tr>
<td>Cholesterol mg/d</td>
<td>130</td>
<td>213.7</td>
</tr>
<tr>
<td>Fiber g/d&lt;sup&gt;f&lt;/sup&gt;</td>
<td>130</td>
<td>213.7</td>
</tr>
<tr>
<td>Vitamin A μg/d</td>
<td>130</td>
<td>213.7</td>
</tr>
<tr>
<td>Vitamin C mg/d</td>
<td>130</td>
<td>213.7</td>
</tr>
<tr>
<td>Vitamin D μg/d</td>
<td>130</td>
<td>213.7</td>
</tr>
<tr>
<td>Vitamin E mg/d</td>
<td>130</td>
<td>213.7</td>
</tr>
<tr>
<td>Vitamin K μg/d&lt;sup&gt;f&lt;/sup&gt;</td>
<td>130</td>
<td>213.7</td>
</tr>
<tr>
<td>Thiamin mg/d</td>
<td>130</td>
<td>213.7</td>
</tr>
<tr>
<td>Riboflavin mg/d</td>
<td>130</td>
<td>213.7</td>
</tr>
<tr>
<td>Niacin mg/d</td>
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<td>213.7</td>
</tr>
<tr>
<td>Nutrient</td>
<td>1</td>
<td>1.2</td>
</tr>
<tr>
<td>-----------------</td>
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<tr>
<td>Vitamin B6 mg/d</td>
<td>1</td>
<td>1.2</td>
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<tr>
<td>Folate μg/d</td>
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<td>270.0</td>
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<tr>
<td>Vitamin B12 μg/d</td>
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<td>Calcium mg/d</td>
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<tr>
<td>Copper mg/d</td>
<td>0.7</td>
<td>0.5</td>
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<tr>
<td>Fluoride mg/d†</td>
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<tr>
<td>Iodine μg/d</td>
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<td>74.7</td>
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<tr>
<td>Iron mg/d</td>
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<td>10.9</td>
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<tr>
<td>Magnesium mg/d</td>
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<td>137.4</td>
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<td>Phosphorus mg/d</td>
<td>1250</td>
<td>791.3</td>
</tr>
<tr>
<td>Zinc mg/d</td>
<td>8</td>
<td>7.4</td>
</tr>
<tr>
<td>Potassium mg/d†</td>
<td>4500</td>
<td>1578.6</td>
</tr>
<tr>
<td>Sodium mg/d†</td>
<td>1500</td>
<td>1553.5</td>
</tr>
</tbody>
</table>

DRIs refer to the Dietary Reference Intakes including Estimated Energy Requirement, Recommended Dietary Allowances, and Adequate Intakes. Dashes indicate that values have not been determined. PBD (Percent Below DRI), for a specific nutrient, PBD refers to the percent of children who consumed a nutrient below the Recommended Dietary Allowance or Adequate Intake.

* Within a specific age group and gender, this superscript indicates significant differences in nutrient consumption between children born in United States versus those born in Thailand/Laos, P < 0.05.

† Estimated Energy Requirement.

† Adequate Intakes.
Table 3. Dietary intakes by birth location for 14-18 year old Hmong children compared with Dietary reference Intakes.

<table>
<thead>
<tr>
<th></th>
<th>Males, 14-18 years</th>
<th>Females, 14-18 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 68</td>
<td>n = 102</td>
</tr>
<tr>
<td></td>
<td>Born Thailand/Laos</td>
<td>Born United States</td>
</tr>
<tr>
<td></td>
<td>B-T/L</td>
<td>B-US</td>
</tr>
<tr>
<td></td>
<td>B-T/L</td>
<td>B-US</td>
</tr>
<tr>
<td>DRIs</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Acculturation Score</td>
<td>—</td>
<td>25.4</td>
</tr>
<tr>
<td>Calories kcal/d</td>
<td>3152</td>
<td>1514.7</td>
</tr>
<tr>
<td>Carbohydrates g/d</td>
<td>130</td>
<td>81.5</td>
</tr>
<tr>
<td>Protein g/d</td>
<td>52</td>
<td>50.6</td>
</tr>
<tr>
<td>Fat g/d</td>
<td>—</td>
<td>52</td>
</tr>
<tr>
<td>Saturated Fat g/d</td>
<td>—</td>
<td>0.7</td>
</tr>
<tr>
<td>Trans Fatty Acid g/d</td>
<td>—</td>
<td>223.6</td>
</tr>
<tr>
<td>Cholesterol mg/d</td>
<td>—</td>
<td>900</td>
</tr>
<tr>
<td>Vitamin A μg/d</td>
<td>900</td>
<td>348.1</td>
</tr>
<tr>
<td>Vitamin C mg/d</td>
<td>75</td>
<td>46.0</td>
</tr>
<tr>
<td>Vitamin D μg/d</td>
<td>15</td>
<td>4.1</td>
</tr>
<tr>
<td>Vitamin E mg/d</td>
<td>15</td>
<td>2.1</td>
</tr>
<tr>
<td>Vitamin K μg/d</td>
<td>75</td>
<td>45.5</td>
</tr>
<tr>
<td>Thiamin mg/d</td>
<td>1.2</td>
<td>1.6</td>
</tr>
<tr>
<td>Riboflavin mg/d</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Niacin mg/d</td>
<td>16</td>
<td>18.1</td>
</tr>
<tr>
<td>Vitamin B₆ mg/d</td>
<td>1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Nutrient</td>
<td>Value 1</td>
<td>Value 2</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>Folate μg/d</td>
<td>400</td>
<td>269.2</td>
</tr>
<tr>
<td>Vitamin B12 μg/d</td>
<td>2.4</td>
<td>4.1</td>
</tr>
<tr>
<td>Calcium mg/d</td>
<td>1300</td>
<td>559.8</td>
</tr>
<tr>
<td>Copper mg/d</td>
<td>0.89</td>
<td>0.5</td>
</tr>
<tr>
<td>Fluoride mg/d†</td>
<td>3</td>
<td>329.7</td>
</tr>
<tr>
<td>Iodine μg/d</td>
<td>150</td>
<td>69.3</td>
</tr>
<tr>
<td>Iron mg/d</td>
<td>11</td>
<td>12.7</td>
</tr>
<tr>
<td>Magnesium mg/d</td>
<td>410</td>
<td>137.6</td>
</tr>
<tr>
<td>Phosphorus mg/d</td>
<td>1250</td>
<td>843.8</td>
</tr>
<tr>
<td>Zinc mg/d</td>
<td>11</td>
<td>9.1</td>
</tr>
<tr>
<td>Potassium mg/d†</td>
<td>4700</td>
<td>1533.2</td>
</tr>
<tr>
<td>Sodium mg/d†</td>
<td>1500</td>
<td>1945.8</td>
</tr>
</tbody>
</table>

DRI is Dietary Reference Intakes including Estimated Energy Requirement, Recommended Dietary Allowances, and Adequate Intakes. Dashes indicate that values have not been determined. PBD (Percent Below DRI), for a specific nutrient, PBD refers to the percent of children who consumed a nutrient below the Recommended Dietary Allowance or Adequate Intake.

* Within a specific age group and gender, this superscript indicates significant differences in nutrient consumption between children born in United States versus those born in Thailand/Laos, P < 0.05.

† Adequate Intakes.
Table 4. MyPyramid analysis of dietary intake among Hmong children.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested servings</td>
<td>Mean SD</td>
<td>Mean SD</td>
<td>Mean SD</td>
<td>Mean SD</td>
<td></td>
</tr>
<tr>
<td>Grains ounce equivalents</td>
<td>6 1.8 1.8 7.2 2.8 5.0 2.3 5.8 2.3 48.9</td>
<td>6 5.0 2.4† 7.7 4.0 6.4 2.6 7.0 4.6 41.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables cups</td>
<td>2.5 0.6 0.4 0.6 1.0 0.3 0.2 0.6 0.6 97.7</td>
<td>2.5 0.7 0.6 0.7 0.8 0.5 0.5 0.9 0.7 95.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits cups</td>
<td>1.5 1.2 0.6 1.0 0.8 1.7 0.5 1.2 0.9 68.2</td>
<td>2 0.8 0.4 0.9 0.9 1.6 1.3† 0.9 1.0 88.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk cups</td>
<td>3 1.4 0.9 1.7 0.8 1.3 0.3 1.4 0.6 98.9</td>
<td>3 1.1 0.7 1.6 1.0 1.2 0.8 1.0 0.8 96.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat and Beans ounce equivalents</td>
<td>5 5.6 4.0 5.7 3.8 4.0 2.3 4.7 2.2 54.5</td>
<td>5.5 6.2 2.6 5.8 5.6 7.1 3.1 5.8 3.7 57.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fats, oils, and sweets†</td>
<td>-- 16.1 4.7† 25.0 0.7 18.9 5.8 21.1 10.6 --</td>
<td>-- 17.3 3.4† 24.6 2.3 21.0 9.2 21.7 11.6 --</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B-T/L, Born or raised in Thailand or Laos and have been living in United States ≤ 5 years. B-US, Born in United States. PBS (Percent Below Suggested), percent of children below the suggested serving for a specific food group.

†Within a specific age group and gender, this superscript indicates significant differences in dietary consumption between children born in United States versus those born in Thailand/Laos, P < 0.05.

†Values indicate total fats, oils, and sweet intake. No suggested MyPyramid serving for fats, oils, and sweets. Generally, such items are classified under ‘discretionary calories’ and are recommended to use sparingly.
CHAPTER 5

Summary, Conclusions, Implications, and Future Directions
SUMMARY

This project found that Hmong, an important Asian American ethnic subgroup, are rapidly acculturating to the US norms and customs including dietary and food related habits. Acculturating to the American environment has influenced Hmong perceptions regarding body image, health, and food habits. Poor dietary choices have negatively influenced this group’s health status, probably leading to conditions such as obesity, type-2 diabetes, hypertension, and cardiovascular diseases. Following is a brief summary of results by the topics of body image, health and diabetes perceptions, and dietary acculturation.

Body Image Perceptions among Hmong

The following results are adapted from the following manuscript:


*Quantitative analysis*

Of all the participants \((N = 335)\), almost half were either overweight or obese, and most overweight/obese children wanted to lose weight. One-fourth of our sample was short statured and almost all of the short statured children (96%) wanted to be taller, indicating body dissatisfaction issues (Chapter 2). About 70% of the girls and 53% of the boys selected smaller body ideals than their perceived body size, while 21% girls and 31% boys were satisfied with their bodies, choosing a common silhouette for their perceived and ideal bodies (Chapter 2).
Our investigation regarding body image perceptions and ideals among Hmong children found that the body image ideals among these children closely match the American ideals of beauty and attractiveness, as indicated by children’s desire to be thinner and taller than their perceived bodies. Shifts in body size preferences from a heavier to a leaner silhouette may be a reflection that Hmong children are acculturating to the dominant American ideals at a faster pace. Previous research has found that body dissatisfaction is associated with the risk for developing eating disorders, low self-esteem, depressive symptoms, and obesity (Cash & Deagle, 1997; Grogan, 2006; Neumark-Sztainer et al., 2006), suggesting that the children in our sample might be prone to develop such conditions now or in their near future.

**Qualitative analysis**

Through previously conducted focus group discussions, the following three themes were identified relating to body image: (a) traditional Hmong female body, (b) current Hmong American beauty ideals, and (c) factors influencing changes in body image perception (Chapter 2).

*Traditional Hmong female body*

Discussions revealed that traditionally, heavier body weight or rounder shape was preferable, specifically among girls and young women. Further, being plump was associated with health, wealth, prosperity, food security, and fertility; thinness was seen as unattractive and often associated with disease. Although plumper body size was preferable in Thailand/Laos, participants agreed that in US, thinness was associated with beauty and attractiveness. Some newly immigrated children reported that their family
elders were aware of the preferred body size in US, and encouraged children to lose weight.

Current Hmong American beauty ideals

While traditionally plumpness was valued within Hmong culture, children agreed that the new body ideal was to be tall and slim (for males and females) and muscular (for males). Some children saw overweight/obesity as a hurdle in finding a marriage partner, and desired thinner silhouettes among themselves and as their partners. Through discussions, children also agreed to behaviors such as dieting, careful food choice, and skipping meals to achieve the thinner body ideal.

Factors influencing changes in body image perception

Children reported that factors such as parents, peers, and media strongly influenced body image attitudes among them, resulting in a shift in preference from the traditional, plumper body size to a newer, slender and taller body size. Children reported that some parents showed concerns about their child’s excess weight by watching or monitoring what/when the child was eating, engaging their children in regular physical activity, and discouraging an unhealthy lifestyle.

Peer influence also shaped body weight perceptions among children and most males associated female slenderness with beauty and desired them as their romantic partners. The appearance appeal relating to body weight was bi-directional in our study and most females were also attracted to leaner males. Apart from parents and peers, media also influenced body image perceptions among Hmong children and children, including the newly immigrated ones were influenced by commercials/equipments.
promising weight loss, television channels such as MTV, VH1, and Bravo, and aspired for thinner, taller, and muscular body ideals and watched such channels regularly, using them as models for hair styles, fashion, and body shape/size.

**Health and Diabetes Perceptions among Hmong Children**

The following results are adapted from the following manuscript:


Our results indicate that most Hmong children are aware of the negative health effects associated with excess body weight, and chose an overweight/obese body as diabetic body and an average sized body as being healthy (Chapter 3). However, this belief was not entirely reflected in children’s current health status, as about half of these children were either overweight or obese, implying that either they did not perceive they have weight issues or a disconnection between their health beliefs and related actions.

Acculturation to the American dietary habits might probably explain higher overweight/obesity among our participants, as easy access and availability to poor food choices in the US might encourage overeating. Some recently migrated children chose thin body types as being diabetic, probably associating this shape with type-1 diabetes. Associating a thinner body with disease can be traced to cultural reasons, as traditional Hmong culture valued and preferred overweight/obesity, often linking a heavier body shape with health, wealth, fertility, and food security. This may also explain high
overweight/obesity among our participants, as some parents/grandparents may be encouraging the children to consume more food to be ‘healthy and strong’.

Through Social Cognitive Theory analysis, we found that environmental factors such as food availability, parental influence, and media shaped children’s health and diabetes perceptions. A child’s observation of their parent’s eating behavior had most impact on children’s health perceptions, and children agreed to eating more food after seeing that their parents ate more (Chapter 3, Table 4). This observation suggests that future interventions aiming to improve Hmong child’s diet should also focus on parental dietary practices and eating behaviors.

Apart from parental influences, a child’s physical environment involving household and school environment, food outlets and stores, and media also shaped their health perceptions (Chapter 3, Table 4). Easy availability of foods such as chips, candy, and soda in home and school environment resulted in children consuming such foods, suggesting that availability of healthy foods such as fruits and vegetables might increase the intake of such foods. Further, educating children about the benefits of healthier food choices and making them aware of such foods in the environment might also encourage change. Media also shaped health perceptions among Hmong children, and children idealized thinner body shapes among themselves after seeing such images on TV. Idealizing thin media images has been associated with eating disorders, low self-esteem, and obesity, suggesting a need for media literacy among Hmong children.
Dietary Acculturation among Hmong

The following results are adapted from the following manuscript:


Results from the dietary analysis suggest that diets of Hmong children are deficient in a number of nutrients including calcium, vitamin-A, vitamin-D, phosphorus, and fiber. The MyPyramid analysis further indicated lower consumption of vegetable and milk food groups among children (Chapter 4, Table 4). Iron intake was specifically low among females and one-third of younger females and two-third of the older females were deficient in this nutrient. Children who were born in the US consumed significantly more calories, carbohydrates, saturated fat, cholesterol, sugars, and sodium and had a significantly higher BMI-for-age than those born in Thailand/Laos, suggesting that the US environment and food related habits are a probable reason for overweight/obesity among Hmong. Further, more acculturated children consumed a significantly higher amount of carbohydrates, grains, saturated fat, trans-fatty acids, calcium, and sodium and had a higher BMI-for-age compared with the less acculturated ones (Chapter 4, Results). Likewise, the number of years lived in the US were positively and significantly associated with a higher consumption of calories, saturated fat, trans-fatty acid, fiber, sodium, and fats, oils, and sweets, and a high BMI-for-age. A higher BMI was also
associated with a significantly higher consumption of sodium and a significantly lower consumption of fruits and milk among all children.

Dietary results indicate a lower consumption of calcium, iron, vitamin-A, vitamin-D, phosphorus, and fiber, and a higher intake sodium, fats, oils, and sweets among our participants. More than 90% of the children did not meet the MyPyramid recommendations for the dairy food group including milk, yogurt, and cheese (Chapter 4, Table 4). Nutrients such as calcium, vitamin D, and phosphorus found in dairy are important for building bone, especially during adolescent years. Consuming a diet deficient in bone building nutrients could negatively impact Hmong children’s health status now or in their future, placing them at a risk to develop osteoporosis. Additionally, Asian ancestry makes Hmong susceptible to develop osteoporosis, necessitating the importance of incorporating calcium and vitamin D in Hmong diets.

Apart from calcium and vitamin D, diets of Hmong children were also deficient in fiber. Further, mean vegetable intake was less than 1 cup per day. It is believed that consuming more Americanized diets has resulted in decreased consumption of fruits and vegetables among Hmong. A diet rich in fiber has many health benefits including preventing obesity and cardiovascular diseases; therefore Hmong children should be educated about fiber and fiber rich foods, especially through school education.
CONCLUSIONS AND IMPLICATIONS

This study found that most Hmong children are adapting to US environment which appears to have a negative influence on this group’s health status. Almost half of the children in our sample were overweight or obese, and our dietary analysis revealed that children were consuming diets high in fats and sweets. Obesity during childhood and adolescent years is a potential risk factor for developing coronary heart disease, hypertension, and diabetes, and even results in premature mortality in adulthood (Bibbins-Domingo et al., 2007; Engeland et al., 2004), suggesting that children in our sample may be at a risk for developing such conditions in their future. Further, Asian ancestry makes Hmong susceptible to develop diseases such as diabetes and osteoporosis, suggesting a need for nutrition education programs with this population.

Given that the Hmong are a fast growing Asian ethnic subgroup in the US, it is important to learn more about their nutritional status and needs from a health care perspective. Additionally, challenges such as cultural discrepancies’ regarding health and illness, limited health literacy, and health disparities emphasize a need to implement culturally and linguistically appropriate programs among Hmong children, and possibly incorporating parents.
FUTURE DIRECTIONS

Our investigation involving body image found that Hmong children are endorsing a thin/muscular beauty ideal over the traditional heavier body preferred by their parents/grandparents. This is an important observation as differing perceptions regarding image could lead to intergenerational conflicts. Research has shown that intergenerational conflicts may lead to eating disorders, depressive symptoms, psychological distress, and even suicides among Asian American adolescents (Choi et al., 2009; Smart, 2010). Therefore, future research should investigate whether and how much do children’s views regarding body image differ from those of parents/grandparents, also assessing depression and anxiety related to body and appearance.

Further, poor eating habits and negative body image among our participants’ are strong risk factors for developing eating disorders. Hence, future research should also investigate the symptoms related to eating disorders among Hmong children using a related instrument (for example, Eating Disorder Inventory-Body Dissatisfaction Scale). Also, our SCT investigation found environment to be an important determinant in shaping health perceptions among children. Future investigations might incorporate follow up studies on how the Hmong environment could be efficiently modified to yield desired health results. Our dietary analysis revealed that the diets of Hmong children are becoming more Americanized with a higher intake of fats, sodium, and sweets. Future studies and interventions should aim to educate younger Hmong about healthy eating habits, providing them nutritional education and counseling on making optimal food
choices. Also, parental dietary habits could also be investigated to know whether parental eating patterns influence a Hmong child’s current dietary behavior and/or health status.
Bibliography
Bibliography


Franzen L, Smith C. Food system access, shopping behavior, and influences on purchasing groceries in adult Hmong living in Minnesota. Am J Health Promot 2010;24:396-409.


Lautenschlager L, Smith C. Beliefs, knowledge, and values held by inner-city youth about gardening, nutrition, and cooking. Agric Human Values 2007;24:245-258.


Appendices
PARENTAL CONSENT FORM

This survey is being conducted by Chery Smith, PhD, MPH, RD and graduate students, Lisa Franzen, MS, RD, and Urvashi Pokhriyal from the Department of Food Science and Nutrition at the University of Minnesota.

Your child has been invited to take part in a survey about the foods they decide to eat. Your child has been invited to take part in this survey because your child is between the ages of 9 and 18 years old. Please read this form and ask any questions you have before agreeing to let your child take part in this survey. This project will require your child to meet with us twice within a two week period. For the first visit, your child will take a survey related to food choice, who or what influences food choice, and food availability, describe what they ate and drank the day before (24-hour dietary recall), assess their body image, and have their height, weight, blood pressure, arm, waist and hip circumferences, and bicep (skin over the bicep muscle), tricep (skin over the tricep muscle), subcapsular (skin under the shoulder blade) and suprailliac (skin just above the hip bone) skinfolds measured. The first visit will last approximately one hour and thirty minutes. The second visit will be shorter and your child will be asked to do another 24-hour dietary recall and to complete a kid’s food frequency questionnaire (FFQ). Completed parental consent and parent information sheets are required for your child to participate in this study. Measurements on you and/or your spouse, such as height, weight, waist and hip circumferences, and blood pressure, are optional and not required for your child to participate in this study.

Risks and Benefits:
There is a slight risk that your child may feel tired while taking the survey because it is long. However, a benefit from taking part in this study is that a nutritional analysis of your child’s 24-hour dietary recall information will be mailed to you if so desired. Also, all measurement data will be provided to you.

Compensation: Your child will receive $25 for the first visit, provided the survey, 24-hour dietary recall, body image assessment, child measurements, parental consent, and parental information form have been completed and then your child will receive another $25 for the second visit, providing the 24-hour dietary recall and kid’s FFQ are completed. If you and/or your spouse are willing to have your measurements done (height, weight, waist and hip circumferences, and blood pressure) you will receive an additional $10.

Confidentiality:
All information shared within this survey and the measurements taken will be kept private, in a locked file cabinet in Dr. Smith’s office. Only Dr. Smith, Lisa Franzen, Urvashi Pokhriyal, and an undergraduate student assistant will have access to the collected information. We will use only first names on the surveys and these will be converted to ID numbers prior to data entry. The information collected may be published, however, you and your child’s privacy will be protected and your names will never be released. Mandatory reporting by the principal investigator will occur should neglect or abuse issues surface.

Voluntary Nature of the Survey:
Your decision to participate in the study and let your child take part (or not take part) in this survey will not affect any current or future relations with the University of Minnesota or any community public program. If you decide to participate in the study and allow your child to take
part in this survey, you are free to withdraw as well as withdraw your child at any time. Also, your child may choose not to answer a question at any time or choose to withdraw at anytime.

Contacts and Questions:
Those conducting this research project are Dr. Chery Smith, Lisa Franzen, and Urvashi Pokhriyal. You may ask any questions you have now, and if you have any questions later, you may contact Dr. Chery Smith at (612) 624-2217 (csmith@umn.edu), Lisa Franzen at (612) 695-7750 (franz143@umn.edu), or Urvashi Pokhriyal at (612) 695-7750 (pokhr001@umn.edu). You will be given a copy of this form to keep for your own records.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), please contact the Research Subjects’ Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

By signing below, you indicate you understand the process involved in this study.

I have read the above information. I agree to let my child _________________________ (name) take part in this group talk. I have asked questions and have received answers.

Signature of Parent or Guardian: __________________________      Date: ________________
Signature of Parent of Guardian: __________________________      Date: ________________
Signature of Investigator: ________________________________      Date: ________________
CHILDREN’S ASSENT FORM

You have been asked to take part in a survey about the foods you eat. We want to learn more about how kids decide what to eat. If you agree to take part in this survey, we will ask you to meet with us twice within two weeks. For your first visit, you will be asked to fill out a survey about the foods you eat, where you get food, and what helps you decide what you are going to eat, tell us what you ate and drank the day before (24-hour dietary recall), evaluate your body image, and have your height, weight, blood pressure, arm, waist and hip circumference, and bicep (skin over the bicep muscle), tricep (skin over the tricep muscle), subscapular (skin under the shoulder blade) and suprailiac (skin just above the hip bone) skinfolds measured. For your second visit, you will be asked to do another 24-hour dietary recall and fill out a kid’s food frequency questionnaire (FFQ).

You can ask questions at any time during the survey. Also, if you decide at any time not to finish, you may stop whenever you want. Remember, these questions are only about what you think. There are no right or wrong answers because this is not a test.

You will get $25 for the first visit, provided you finish the survey, evaluate your body image, do the 24-hour dietary recall, and have your measurements taken. You will get another $25 for the second visit, provided you do another 24-hour dietary recall and finish a FFQ.

Other people will not know if you are in this survey. We will put things we learn about you together with things we learn about other children, so no one can tell what things came from you. If we tell other people about this survey, we will not use your name, so no one can ever tell who we are talking about.

Your parents or guardian have to say it’s OK for you to be a part of this survey. After they decide, you get to choose if you want to do it too. Signing this paper means that you have read this or had it read to you and you want to be a part of this survey. If you do not want to be a part of this survey, do not sign the paper. It is up to you if you want to be a part of it and no one will be mad if you do not sign this paper or even if you change your mind later.

Signature: ____________________________ Date: ____________

Signature of Researcher: ____________________________ Date: ____________
FOCUS GROUP QUESTIONS AND PROMPTS PERTAINING TO BODY IMAGE

- In Hmong culture what kind of body type is preferred? What do you prefer? To be heavier? To be thinner? To be just as you are? Do you and your parents/grandparents think differently or the same about desired body shape?

- We have heard parents and others say that traditionally heavier women were desirable as marriage partners. Have you ever heard that? Why do you think that is?

- What do your parents/grandparents think about your body shape? Do they want you to eat more? Eat less? Exercise more? Not to exercise? Do your parents/grandparents ever make positive or negative comments about weight?

- How important is a person’s body weight to you when you look at others? For example, do you have both heavy and thin friends? Is their weight important to you? When you think about boys/girls (depending on gender) what is important to you? Is their weight or height important?

- Where did you get your ideas about body weight and shape and what is attractive and what is not?

- How much TV do you watch a day? What kind of commercials do they show? Do commercials help you to decide which foods to eat? Does media (TV, internet, magazines) impact how you feel about yourself (body image)? What kinds of TV programs and/or commercials help you decide what you should look like?

- What or who do you think is beautiful? Do you feel pressured to look a certain way?
Thank you for taking this survey! This is a survey to find out how kids make food choices. **There is no right or wrong answer.** If you are not sure what one of the questions means, please ask us and we will be happy to help you.

**Name:** ___________________________  
**Age:** ______  
**Grade:** _____  
**Gender:** Girl / Boy

If you were born in the US, what state were you born in? _____________________  
If you were NOT born in the US: 1) where were you born? _____________________; 2) How long have you lived in the US? ____________

How much do you think you weigh? __________ lbs; How tall do you think you are? __________ feet __________ inches

Please check only one box for each question. Unsure = the question does not apply to you.  
Men in family= dad, grandpa, uncle, brother, and/or cousin

### I. ENVIRONMENT/SITUATION

<table>
<thead>
<tr>
<th>Internal</th>
<th>Strongly Agree</th>
<th>Mostly Agree</th>
<th>Unsure</th>
<th>Mostly Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I eat vegetables everyday.</td>
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<tr>
<td>I eat fruits everyday.</td>
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<tr>
<td>Milk is always in my home.</td>
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<tr>
<td>Milk is important to drink.</td>
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<tr>
<td>While living in Minnesota, I eat a lot of chips, candy, and pop.</td>
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<tr>
<td>We have dessert every night after dinner.</td>
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<tr>
<td><strong>Internal</strong></td>
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<tr>
<td>Even if I am full, my parents want me to eat more.</td>
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<tr>
<td>Even if I am full, my grandparents want me to eat more.</td>
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<tr>
<td>My parents encourage me to eat so I will be big and strong.</td>
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<tr>
<td>I gain weight because there is always food to eat.</td>
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<tr>
<td>I cannot lose weight because there is too much food to eat.</td>
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<tr>
<td>My parents tell me I should lose weight.</td>
<td>Strongly Agree</td>
<td>Mostly Agree</td>
<td>Unsure</td>
<td>Mostly Disagree</td>
<td>Strongly Disagree</td>
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<tr>
<td>My grandparents tell me I should gain weight.</td>
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</table>

**External**

- When I see chips, candy, or pop on TV, I ask my mom or dad if we can buy it.
- I eat snack foods like chips, candy, and pop when I watch TV.
- TV commercials help me decide which foods I want to eat.
- At parties and celebrations I drink pop and eat sweets/desserts.
- I think I should be thinner because the people on TV are thin.
- I eat school lunch so that I can be more like my non-Hmong friends.

**External**

- I eat salads and other vegetables at school.
- I eat fruits at school.
- There is a place available for me to exercise at school and/or after school.
- My friends like to eat and hang out at fast food restaurants.

**Observational Learning**

- I try to lose weight because people I watch on TV are thin.
- I try to lose weight because my friends try to lose weight.
- I try to lose weight because my parents are worried about my health.
- I eat chips, candy, and pop because people who I care about do.
- I eat desserts because I see my parents eat them.
- I eat the same foods that I see my friends eat.
- When I see my friends eat a lot, I do too.
- When I see my parents eat a lot, I do too.

**Observational Learning**
I eat foods that are good for my body because people who I care about do.  

I do not eat fruits because my family does not eat them.  

I do not eat vegetables because my family does not eat them.  

II. BEHAVIOR: BEHAVIORAL CAPABILITY  

I have made it a habit to overeat at mealtimes.  

I make it a habit to eat foods that are good for me.  

At school it is hard to not eat chips, candy, and pop.  

I am able to choose unsweetened cereal over sweetened cereal to eat.  

TV shows me what my body should look like.  

I can burn off calories when I overeat by exercising more.  

BEHAVIOR: OUTCOME EXPECTATIONS  

Foods eaten at school are making my diet more American.  

American food is high in fat and calories and bad for my body.  

Hmong food is high in oil and salt and bad for my body.  

I drink milk because it is an important part of my diet.  

If I am heavy I will look healthy.  

If I am thin I will look healthy.  

If I am thin I will look like the people I watch on TV.  

III. PERSONAL  

Outcome Expectancies  

Overeating at mealtimes will keep me from getting hungry between meals.  

I can stop myself from eating when I am full.
Because I want to look good, I should gain weight.
Because I want to look good, I should lose weight.
Because I like to eat, I eat too much.
If I eat less rice I will lose weight.
Eating fruits is important to keep me healthy.
Eating vegetables is important to keep me healthy.
If I eat too much rice I increase my chances of getting diabetes when I am older.

**Personal Reinforcement**
I like to eat vegetables because my parents do.
I like to eat fruits because my parents do.
I like to eat chips, candy, and pop because my friends do.
I like to eat chips, candy, and pop because I see them on TV.
If I eat chips, candy, and pop I gain weight.
I like to eat American foods because my friends like to eat them.
I like to eat American foods because I eat them at school.
I like to eat American foods because my parents like to eat them.
When I eat less rice, I lose weight.
If my friends try to lose weight I do too.

**Self-efficacy**
It is hard to eat fruit everyday.
I am able to make my own food choices.
It is hard to eat vegetables every day.
I can eat fruits instead of candy.
I can drink juice or water instead of pop.
I can choose healthy foods over junk foods.  
I can maintain a thin body weight.  
I can maintain a normal (not too thin/not too heavy but medium size) body weight.

<table>
<thead>
<tr>
<th>Self-control &amp; Performance</th>
<th>Strongly Agree</th>
<th>Mostly Agree</th>
<th>Unsure</th>
<th>Mostly Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I eat while I watch TV.</td>
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<tr>
<td>When there is nothing to do, I like to eat.</td>
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<tr>
<td>If I overeat then I exercise more.</td>
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<tr>
<td>I try not to eat too much fast food because it is greasy and fattening.</td>
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<tr>
<td>I can skip meals to lose weight.</td>
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<tr>
<td>I can lose weight so I look like the people I watch on TV.</td>
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</table>

<table>
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<tr>
<th>Emotional Coping Response</th>
<th>Strongly Agree</th>
<th>Mostly Agree</th>
<th>Unsure</th>
<th>Mostly Disagree</th>
<th>Strongly Disagree</th>
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</thead>
<tbody>
<tr>
<td>I overeat at mealtimes so I will not be hungry later on.</td>
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<tr>
<td>I finish my plate of food at mealtimes even when I am full.</td>
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<tr>
<td>I eat chips, candy, and pop to make me feel better.</td>
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<tr>
<td>I eat vegetables because they are good for my body.</td>
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<tr>
<td>I eat fruits because they are good for my body.</td>
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<tr>
<td>I eat less food when I feel like I look too heavy.</td>
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<tr>
<td>I eat more food when I feel like I look too thin.</td>
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</tbody>
</table>

COOKING QUESTIONS:
1. I started cooking food at age _________________.
2. I started cooking rice at age _________________.
3. I started to cook more complex dishes (i.e. phở, egg rolls, or soups) at age _________________.
4. The first three foods I learned to cook were: (1) ______________________, (2) ______________________, and (3) ______________________.

QUESTIONS:
1. What language(s) do you speak at home?
   a. Only in Hmong
   b. More Hmong than English
   c. Both Hmong and English equally
   d. More English than Hmong
   e. Only English

2. In what language do you usually think?
   a. Only in Hmong
   b. More Hmong than English
   c. Both Hmong and English equally
   d. More English than Hmong
   e. Only English

3. Your closest friends are _____.
   a. All Hmong
   b. More Hmong than Americans
   c. About half and half
   d. More Americans than Hmong
   e. All Americans

4. What languages do you speak with friends?
   a. Only in Hmong
   b. More Hmong than English
   c. Both Hmong and English equally
   d. More English than Hmong
   e. Only English

5. I see myself as (only choose one):
   a. Hmong
   b. Hmong-American
   c. American

6. “I eat ____.”
   a. Only Hmong foods
   b. Mostly Hmong foods
   c. Equal amounts of Hmong and American foods
   d. Mostly American foods
   e. Only American foods.

ID #_____
4. I eat __________ for breakfast.
   a. Only Hmong foods
   b. Mostly Hmong foods
   c. Equal amounts of Hmong and American foods
   d. Mostly American foods
   e. Only American foods

9. I eat __________ for lunch.
   a. Only Hmong foods
   b. Mostly Hmong foods
   c. Equal amounts of Hmong and American foods
   d. Mostly American foods
   e. Only American foods

5. I eat __________ for dinner.
   a. Only Hmong foods
   b. Mostly Hmong foods
   c. Equal amount of Hmong and American foods
   d. Mostly American foods
   e. Only American foods

10. I eat __________ for snacks.
    a. Only Hmong foods
    b. Mostly Hmong foods
    c. Equal amounts of Hmong and American foods
    d. Mostly American foods
    e. Only American foods
FOOD SECURITY QUESTIONS:

The following questions are about the food situation in your home during the last month. Please put an X by the answer that best describes you.

1. Did you worry that food at home would run out before your family got money to buy more?
   _____ A LOT  _____ SOMETIMES  _____ NEVER

2. Did the food that your family bought run out, and you didn’t have money to get more?
   _____ A LOT  _____ SOMETIMES  _____ NEVER

3. Did your meals only include a few kinds of cheap foods because your family was running out of money to buy food?
   _____ A LOT  _____ SOMETIMES  _____ NEVER

4. How often were you not able to eat a balanced meal because your family didn’t have enough money?
   _____ A LOT  _____ SOMETIMES  _____ NEVER

5. Did you have to eat less because your family didn’t have enough money to buy food?
   _____ A LOT  _____ SOMETIMES  _____ NEVER

6. Has the size of your meals been cut because your family didn’t have enough money for food?
   _____ A LOT  _____ SOMETIMES  _____ NEVER

7. Did you have to skip a meal because your family didn’t have enough money for food?
   _____ A LOT  _____ SOMETIMES  _____ NEVER

8. Were you hungry but didn’t eat because your family didn’t have enough food?
9. Did you not eat for a **whole day** because your family didn’t have enough money for food?

<table>
<thead>
<tr>
<th></th>
<th>A LOT</th>
<th>SOMETIMES</th>
<th>NEVER</th>
</tr>
</thead>
</table>

**FOOD FREQUENCY QUESTIONNAIRE**

**PLEASE PLACE AN X IN THE BOX THAT RELATES TO HOW OFTEN YOU EAT THE FOLLOWING FOODS.**

<table>
<thead>
<tr>
<th>Food</th>
<th>Daily</th>
<th>2-3 times/week</th>
<th>1 time/week</th>
<th>2-3 times/month</th>
<th>Holidays Only</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apples</td>
<td></td>
<td></td>
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<tr>
<td>Bananas</td>
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<tr>
<td>Carrots</td>
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<tr>
<td>Mango</td>
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<tr>
<td>Oranges</td>
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<tr>
<td>Papaya</td>
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<tr>
<td>Tomatoes</td>
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<tr>
<td>Bamboo</td>
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<tr>
<td>Broccoli</td>
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<tr>
<td>Cilantro</td>
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<tr>
<td>Lemon grass</td>
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<tr>
<td>Lettuce</td>
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<tr>
<td>Peppers</td>
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<tr>
<td>Squash</td>
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<tr>
<td>Taro</td>
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<tr>
<td>Bacon</td>
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ID #_____
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<thead>
<tr>
<th>Food</th>
<th>Daily</th>
<th>2-3 times/week</th>
<th>1 time/week</th>
<th>2-3 times/month</th>
<th>Holidays Only</th>
<th>Never</th>
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<tbody>
<tr>
<td>Beef</td>
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<td>Eggs</td>
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<td>Fish</td>
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<td>Organ meat (tripe, tongue, feet)</td>
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<td>Venison/Deer</td>
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<td>Milk, flavored</td>
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<td>2-3 times/week</td>
<td>1 time/week</td>
<td>2-3 times/month</td>
<td>Holidays Only</td>
<td>Never</td>
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<td>Jasmine rice</td>
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<tr>
<td>Rice with water</td>
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<tr>
<td>Sticky rice</td>
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<tr>
<td>Sweetened Cereal</td>
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<tr>
<td>Unsweetened Cereal</td>
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<td>Wheat bread</td>
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<tr>
<td>Food</td>
<td>Daily</td>
<td>2-3 times/week</td>
<td>1 time/week</td>
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<td>Holidays Only</td>
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<tr>
<td>Cold meat (ham, turkey) sandwich</td>
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<tr>
<td>Cupia</td>
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<tr>
<td>Egg Rolls</td>
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<td>Hamburger</td>
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<tr>
<td>Kapong</td>
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<td>La</td>
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<tr>
<td>Macaroni &amp; cheese</td>
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<tr>
<td>Papaya salad</td>
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<tr>
<td>Pasta</td>
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<tr>
<td>Peanut butter &amp; jelly sandwich</td>
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<tr>
<td>Phò</td>
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<tr>
<td>Pizza</td>
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<tr>
<td>Rice with meat and vegetables</td>
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<td>McDonald’s</td>
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<td>Candy</td>
<td>Cookies</td>
<td>Chocolate</td>
<td>Pudding</td>
<td>Tri-color</td>
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**Anthropometric Measurements:**

1. Weight: (1)__________kg; (2) ___________kg

6. Waist Circumference: (1)__________;

(2)__________

2. Height: (1)__________cm; (2) ___________cm

7. Hip Circumference: (1)__________;

(2)__________
3. Sitting Height: (1) __________ cm; (2) __________ cm

8. Blood Pressure: (1) ______ mmHg; (2) ______ mmHg

4. Arm Circumferences: (1) __________; (2) __________

5. Skin Folds:
   a. Triceps: (1) __________ cm; (2) __________ cm
   b. Biceps: (1) __________ cm; (2) __________ cm
   c. Subscapular: (1) __________ cm; (2) __________ cm
   d. Suprailliac: (1) __________ cm; (2) __________ cm
<table>
<thead>
<tr>
<th>Time Consumed</th>
<th>Food Item</th>
<th>Serving Size</th>
<th>Where</th>
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<tr>
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<tr>
<td>Snack</td>
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<tr>
<td>Dinner</td>
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<tr>
<td>Snack</td>
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</tbody>
</table>

Rice Intake: Breakfast _________; Lunch _________; Dinner _________; Total _________