# NUTRIENT INTAKE AND ADEQUACY AND CONSUMPTION OF FOOD AWAY FROM HOME OF ADULTS WITH CHILDREN

by

CAROLYN LAND WILLIAMS

LINDA L. KNOL, COMMITTEE CO-CHAIR
LORI W. TURNER, COMMITTEE CO-CHAIR
BRAD E. LIAN
CLIFF A. ROBB
STUART L. USDAN

A DISSERTATION

Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
in the Department of Health Sciences
in the Graduate School of
The University of Alabama

TUSCALOOSA, ALABAMA

2011

ABSTRACT

The dietary intake of Americans does not meet current recommendations. A greater desire for quick, convenient food options and food prepared outside the home (FAFH) may be two contributors to poor intake patterns. The Food Choice Process Model suggests that life changes such as becoming a parent may place additional time constraints on adults that in turn will impact on their food choices. Therefore, the purpose of this study was to examine differences in dietary intake of U.S. adults by (a) child presence in the household and (b) child presence plus frequency of FAFH. A sample of 4,904 adults, 18 to 50 years, was selected from the National Health and Nutrition Examination Survey (2005 to 2008). Using linear regression and logistic regression models, dietary intake was compared based on child presence in the household while controlling for variables that represented constructs of the Food Choice Process Model. When compared to females without children, females with children consumed significantly less fiber and were less likely to meet their fiber requirements. When examined by child presence and FAFH frequency, females with low FAFH frequency (≤1 FAFH meal per week) without children in the household had significantly lower total fat, saturated fat, and sodium intakes compared to high frequency users regardless of child presence. Females with children with high FAFH frequency (≥2 FAFH meals per week) were less likely to meet the recommendations for fiber intake and more likely to exceed the recommendations for sodium intake compared to females with children with low FAFH frequency. There were no clinically relevant findings for men. Dietary intake of women but not men changes based on whether a child is present in the household and meals are consumed away from home.

DEDICATION

This dissertation is dedicated to my husband, Brian Williams, and to my daughter, Madeline McCharen Williams, who arrived in Spring 2007 during my doctoral coursework, and to my son, Robert Griffin Williams, who arrived in Spring 2010 during my dissertation work.

LIST OF ABBREVIATIONS AND SYMBOLS

| | |
|---|---|
| *AI* | Adequate Intake |
| *AMDR* | Acceptable Macronutrient Distribution Ranges |
| *ATUS* | American Time Use Survey |
| *BMI* | Body mass index |
| *CARDIA* | The Coronary Artery Risk Development in Young Adults Study |
| *CDAH* | Childhood Determinants to Adult Health Study |
| *CDC* | Centers for Disease Control |
| *CNPP* | Center for Nutrition Policy and Promotion |
| *CSFII* | Continuing Survey of Food Intakes by Individuals |
| *DHKS* | Diet and Health Knowledge Survey |
| *DRI* | Dietary Reference Intakes |
| *EAR* | Estimated Average Requirements |
| *EER* | Estimated energy requirements |
| *ERS* | Economic Research Service |
| *FAFH* | Food away from home |
| *HEI-2005* | Healthy Eating Index for the *2005 Dietary Guidelines for Americans* |
| *HFCS* | Household Food Consumption Survey |
| *HNIS* | Human Nutrition Information Service |
| *MDS* | Mediterranean Diet Score |
| *NAS* | National Academy of Science |

| | |
|---|---|
| *NCHS* | National Center for Health Statistics |
| *NFCS* | Nationwide Food Consumption Survey |
| *NHANES* | National Health and Nutrition Examination Survey |
| *NHLBI* | National Heart, Lung, and Blood Institute |
| *NIDDK* | National Institute of Diabetes and Digestive and Kidney Diseases |
| *NIH* | National Institutes of Health |
| *UL* | Tolerable Upper Intake Level |
| *USDA* | United States Department of Agriculture |
| *USDHHS* | United States Department of Health and Human Services |

ACKNOWLEDGMENTS

I would like to thank all of my committee members, Dr. Linda Knol, Dr. Lori Turner, Dr. Stuart Usdan, Dr. Bran Lian, and Dr. Cliff Robb for their guidance, critical expertise, and positive feedback that they provided throughout my dissertation process. My dissertation committee chairs, Dr. Knol and Dr. Turner, both played invaluable roles in the process to me. Thank you, Dr. Knol for your SAS and statistics knowledge and for all of your purple pen marks. Thank you, Dr. Turner, for helping me get started with the dissertation process and realizing that completing a dissertation while working and with children was possible.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

# CHAPTER 1

## INTRODUCTION

The chronic disease statistics are staggering. Sixty-eight percent of the American population is overweight or obese (Flegel, Carroll, Ogden, & Curtin, 2010). One in three Americans is hypertensive (NHLBI, 2008). Twenty-six percent of Americans over the age of 20 are believed to have pre-diabetes, and 11% of Americans over 20 years of age have Type 2 diabetes (NIDDK, 2007). Many factors, including genetics, lifestyle, environment, and dietary intake influence and impact the development of obesity and these chronic diseases.

Americans have more resources than ever for maintaining health and preventing disease through diet, yet research indicates that Americans' diets have declined in quality. Current intake patterns suggest Americans' diets are low in vegetables, low fat dairy products, and whole grains, while too high in added sugars, added fats, and refined grains. In addition, intake studies suggest Americans' total caloric intake has gradually increased over the past three decades (Guenther, Juan, Lino, Hiza, Fungwe, & Lucas, 2008; Nielsen, Siega-Riz, & Popkin, 2002; Wells & Busby, 2008).

Largely influencing these changes are increased workloads and busier lifestyles which have created a greater desire for quick, convenient food options. Snacking has increased during the day, and, due to advances in technology, the availability of prepared food or partially-prepared convenience products has increased. Reliance on meals prepared outside of the home at restaurants, fast food establishments, and pizza deliveries has increased, while meal preparation at home has decreased. Eating meals prepared outside of the home has increased so

much in fact that the Centers for Disease Control and Prevention (CDC) has identified the American populations' reliance on food prepared outside of the home as one of the contributing factors to the rise in obesity and possible other chronic diseases (CDC, NCHS, 2006).

One sector of the population that may be experiencing greater dietary decline than others is adults with children in the home. Transitions in life such as leaving home, marriage, divorce, and becoming a parent, have been associated with changes in health behaviors (Felner, Farber, & Primavera, 1983), and changes in dietary habits have specifically been linked to changes in marital status and becoming a parent (Burke, Beilin, Dunbar, & Kevan, 2004; Devine, Connors, & Bisgoni, 1998). One might expect that with the overall decline in Americans' dietary intake due to increased workload and time demands, parents' diets might have declined even further compared to adults without children. However, little research exists on how the diets of adults with children in the home differ from diets of adults without children in the home.

## Statement of the Problem

Although guidelines and resources exist to encourage good dietary intake and to promote health, Americans' diet quality has decreased over the past three decades (Guenther et al., 2008; Nielsen, Siega-Riz, & Popkin, 2002; Wells & Busby, 2008). Poor diet quality is contributing to the increased prevalence of obese and overweight individuals, as well as other chronic diseases such as heart disease and diabetes (Lin & Frazao, 1999). Research has suggested that adults with children in the home have poorer diet quality and health than those without children in the home (Burke et al., 2004; Laroche, Hofer, & Davis, 2007). This is an important area to further investigate since parental dietary intake has been directly correlated to a child's dietary intake (Boutelle, Fulkerson, Neumark-Sztainer, Story, & French, 2007; Chung, Reckase, & Schoemer, 2009; Gibson, Wardle, & Watts, 1998; Oliveria, Ellison, Moore, Gillman, Garrahie, & Singer, 2002).

## Purpose of the Study

The purpose of this study was to identify relationships in nutrient intakes and adequacy between adults with and without children in the household, and then examine how frequency of meals consumed that are prepared away from home modified these relationships.

## Theoretical Framework

Due to the use of secondary data in the study, it was difficult to apply a health behavior theory since behaviors and motivators are not examined in this type of data. Therefore, the researcher used the Food Choice Process Model to help understand food intake and decisions in regards to adults with and without children in the home. The Food Choice Process Model was proposed by Furst, Connors, Bisgoni, Sobal, & Falk in 1996. Prior to its introduction, food choice theories had centered around one viewpoint or perspective, such as economic, behavioral, or cognitive. The Food Choice Process Model was the first framework to propose that all of these perspectives influenced and impacted one another when a person makes food decisions. It also suggested that a person values certain things, such as time, money, convenience, and health, yet will negotiate these values when faced with different influences and situations (Furst et al., 1996).

The Food Choice Process Model was a thorough model to use in regards to food choice because it addressed economic, psychological, behavioral, and cognitive influences related to food decisions. This framework was useful when examining the decrease in American diet quality due to the multitude of contributors to decreased diet quality that stem from different viewpoints and settings.

## Research Questions

This study addressed the following research questions:

1. Are there significant differences in nutrient intakes between adults with and without children living in the household? Nutrients examined included: total fat, saturated fat, protein, carbohydrate, cholesterol, fiber, sodium, calcium, and iron.

2. Are adults with children in the household more likely to meet national dietary recommendations than adults without children in the household? Nutrient recommendations examined included: Compliance to National Academy of Sciences' (NAS) Acceptable Macronutrient Distribution Ranges (AMDR) for total fat, saturated fat, protein, and carbohydrate, the United States Department of Agriculture (USDA) *2005 Dietary Guidelines* recommendation for cholesterol, the Adequate Intake levels (AI) for fiber and calcium, the Tolerable Upper Intake Level (UL) for sodium, and the Estimated Average Requirement (EAR) for iron.

3. Does having children in the home modify the relationship between frequency of foods eaten outside the home and nutrient intakes? Nutrients examined included: total fat, saturated fat, protein, carbohydrate, cholesterol, fiber, sodium, calcium, and iron.

4. Does having children in the home modify the relationship between frequency of foods eaten outside the home and compliance to national dietary recommendations? Nutrient recommendations examined included: Compliance to AMDR for total fat, saturated fat, protein, and carbohydrate, the USDA's *2010* and *2005 Dietary Guidelines for Americans* recommendation for cholesterol, AI for fiber and calcium, UL for sodium, and EAR for iron.

## Scope and Significance of the Study

This study used secondary data for adults from the National Health and Nutrition Examination Survey (NHANES) gathered from 2005 to 2008. NHANES data include only non-

institutionalized United States civilians and oversamples subgroups of the population that are typically under-sampled. The researcher used data from survey participants between the ages of 18 and 50 years who completed two days of dietary recalls, excluding pregnant women, resulting in a sample size of 4,904.

One limitation of this study was that results may lack generalizability for individuals who were institutionalized, non-civilian or pregnant. A second limitation of the study was that dietary recall information was based upon self-reports from the individual being interviewed. However, use of the Automated Multiple Pass Method, which is a computer-based recording system where interviewers are prompted to ask additional questions and gather additional details based on respondent's feedback during dietary interviews, significantly improved validity and reliability of this type of data collection and was discussed more thoroughly in Appendix B.

The study helped determine if adults with children in the household have significantly different nutrient intakes and if they were more or less likely to meet nutrient guidelines in comparison to adults without children in the household. It also examined the frequency that adults with and without children in the home eat meals prepared away from home and the effect this frequency had on nutrient intakes and nutrient guideline compliance. Results of this study helped identify specific areas in the diet that need improvement. The Food Choice Process Model was then used to examine the target population more in-depth to create targeted health behavior interventions to not only improve the adult's diet and health, but also the entire family's health.

## Conceptual Definitions

*Added fat.* Added fat refers to fat that is added during cooking or processing and does not refer to the fat that is naturally found in a food (Wells & Busby, 2008).

*Added sugar.* Added sugar refers to sugars or sweeteners that are added during cooking or processing. It does not refer to sugar naturally found in food. Calories from added sugars are considered part of one's discretionary calorie allowance according to MyPyramid guidelines (Murphy & Britten, 2006; Wells & Busby, 2008).

*Body mass index (BMI).* Body mass index is a calculated measurement based on an individual's weight and height that can be used to as a quick screening tool to assess weight status. BMI is calculated using the following formula: BMI = Weight (kg) / [height (m)]$^2$ (NIH, 2000). Once calculated, an individual's BMI score can be used to classify a person's weight status. A person's weight may be classified as underweight (BMI < 18.5), normal (BMI is 18.5 to 24.9), overweight (BMI is 25.0-29.9), or obese (BMI ≥ 30.0) (NIH, 2000).

*Continuing Survey of Food Intakes by Individuals.* The Continuing Survey of Food Intakes by Individuals (CFSII) was initiated in 1985, and its purpose was to examine individual's intakes and dietary status rather than household intakes. The first CSFII was from 1985 to 1986 and gathered data through 24-hour recalls conducted once every two months for one year. The next CSFII was conducted in 1989 to 1991, and dietary intake was collected from individuals for three days and also included the Diet and Health Knowledge Survey (DHKS). The DHKS was the first survey to examine nutrition knowledge and beliefs about food and diet and was given to household individual who was identified as the main meal preparer.

CSFII surveys were again conducted from 1994 to 1996 and specifically chose to oversample those populations that were often under-represented, such as children, elderly, and low-income populations. The DHKS was given this time to one adult in the household and not necessarily the main meal preparer. The surveys were commonly referred to as "What We Eat in American" (USDA, ARS, 1997). In 2002, the USDA and United States Department of Health and Human Services (USDHHS) formed a partnership when they decided to integrate the

USDA's CSFII and the HHS' NHANES into one survey. This new survey was called What We Eat in America (WWEIA), NHANES (USDA, ARS, 2009).

*Dietary Guidelines for Americans.* The *Dietary Guidelines for Americans* are a set of national diet and health recommendations developed, revised and published every five years by USDA and the USDHHS based on scientific research and knowledge. The goal of the guidelines is to provide health professionals and policy makers with a framework that will maintain or improve health, as well as reduce the risks of lifestyle-related diseases of the American public (HHS & USDA, 2010). The current guidelines are the *2010 Dietary Guidelines for Americans*.

*Discretionary calorie allowance.* Discretionary calorie allowance refers to the balance of calories left after consuming nutrient-dense foods to meet dietary and nutrient recommendations that may be used on foods that are not as nutrient-dense, such as those with added sugars, added fats, or alcoholic beverages (Murphy & Britten, 2006).

*Fast food.* Fast food is food obtained at a quick-service restaurant such as drive-thru restaurants, pizza places, or any place where there is not a wait staff (Mancino & Newman, 2007).

*Food at home or meals at home.* Any food or meal consumed that is prepared or requires some preparation in a home. This definition is based on where the food is prepared and does not take into account where the food is eaten. Food prepared at home and taken elsewhere to be eaten is still considered food at home (Mancino & Newman, 2007).

*Food away from home or meals away a home.* Food away from home (FAFH) refers to any food or meal consumed that is prepared or purchased outside of the home. This definition is based on where the food is prepared and does not take into account where the food is eaten. Food away from home includes restaurant food, fast food, pizza delivery, and to-go food (Mancino & Newman, 2007).

*Healthy Eating Index.* The Healthy Eating Index (HEI) is a calculation developed to measure adherence to the *Dietary Guidelines for Americans*. The HEI was revised in 2005 to reflect the *2005 Dietary Guidelines for Americans*. The HEI systematically awards points in 10 dietary categories based on how well an individual's daily intake meets the guidelines with 100 total possible points available for an individual to earn. Higher scores in each category signify better adherence to recommendations for that category (USDA, CNPP, 2008). An HEI has not been developed to reflect the *2010 Dietary Guidelines for Americans.*

*Household Food Consumption Surveys.* The Household Food Consumption Surveys (HFCS) were the first surveys conducted to assess food consumption nationwide and year round; previous surveys only examined small groups during one season of food intake. HFCS 1965-66 collected dietary intake information from 1965 to 1966 through 24-hour recalls and information on household food use in a week period. The Nationwide Food Consumption Survey (NFCS) were conducted again from 1977 to 1978 and from 1987 to 1988. Dietary intake information for these two was gathered through 24-hour recalls, two-day diet records, and weekly household food consumption surveys (USDA, HNIS, 1991).

*MyPyramid.* MyPyramid is a visual diagram, as well as individualized eating plans, for the American public to use to incorporate the *Dietary Guidelines for Americans* into daily eating habits. MyPyramid was developed by the USDA and has an interactive website at http://www.mypyramid.gov. At the website, the American public is able to determine calorie needs based on age, gender, activity level, and weight goals. The interactive site then sets an individualized calorie level with specific food group servings to meet energy and other nutrient needs (USDA, CNPP, 2005).

*National Health and Nutrition Examination Surveys.* National Health and Nutrition Examination Surveys (NHANES) are periodic nationwide surveys to examine the health and

dietary status of Americans conducted by the USDHHS. These surveys obtain dietary intake, anthropometrics, blood and urine samples, and conduct physical examinations. This survey is commonly referred to as NHANES. NHANES I was conducted from 1971 to 1975 and was followed immediately by NHANES II from 1976 to 1980. NHANES III ran from 1988 to 1994 and included over 33,000 people age two and over (USDA, NCHS, 2009). In 2002, the USDA and USDHHS integrated CSFII and NHANES into one survey. This new survey is called What We Eat in America (WWEIA), NHANES (USDA, ARS, 2009).

*Normal weight.* Normal weight is defined as having a BMI at or between 18.5 and 24.9 (NIH, 2000).

*Nutrient dense or nutrient density.* Nutrient dense refers to a food that is high in nutrients with relatively few calories. Nutrient density refers to the amount of nutrient(s) in comparison to a certain amount of calories. Foods low in nutrient density would be foods supplying calories with little to no nutrients. Examples of low nutrient dense foods are candy and soft drinks. Examples of high nutrient dense foods are fruits, vegetables, and low-fat dairy products (Murphy & Britten, 2006).

*Obese or obesity.* Obese is defined as having a BMI at 30.0 or above. If an individual was determined to be obese, then the individual would be diagnosed as having obesity (NIH, 2000).

*Overweight.* Overweight is defined as having a BMI at or between 25.0 and 29.9 (NIH, 2000).

*Refined grains.* Refined grains are grains that have been stripped of one or more of its outer layers. A grain stripped of any of its layers cannot be termed a whole grain (Murphy & Britten, 2006).

*Restaurants.* Restaurants refer to food establishments with a wait staff. Food is typically eaten there but may also be picked up and eaten at another location such as a home (USDA, ERS, 1997).

*Solid fat.* Fats and fat products that are solid at room temperature such as butter, lard, and shortening, as well as fat found in animal products such as meat and dairy products and processed foods made from hydrogenated vegetables oils. These fats are generally higher in saturated fat and/ or *trans* fats. Calories from solid fats are considered part of one's discretionary calorie allowance according to MyPyramid guidelines (Murphy & Britten, 2006).

*What We Eat in America, NHANES.* What We Eat in America (WWEIA), NHANES is a national nutrition survey conducted jointly by the DHHS and the USDA. It was started in 2001 and combined two previous surveys into one – the CFSI and NHANES. Information is gathered in two-year increments starting with 2001-2002. The portion of NHANES that is typically also referred to as WWEIA is the two dietary recall days.

*Whole grains.* Grains that include all layers of the original grain (Murphy & Britten, 2006).

# CHAPTER 2

## PRESENCE OF CHILDREN IN THE HOUSEHOLD DOES NOT INFLUENCE ADULT INTAKE OR ADHERENCE TO DIETARY RECOMMENDATIONS

Americans' diets are low in vegetables, low fat dairy products, and whole grains, while too high in added sugars, added fats, and refined grains (Guenther, Juan, Lino, Hiza, Fungwe, & Lucas, 2008; Nielsen, Siega-Riz, & Popkin, 2002; Wells & Busby, 2008). In addition, intake studies suggest Americans' total caloric intake has gradually increased over the past three decades (Guenther et al., 2008; Nielsen, Siega-Riz, & Popkin, 2002; Wells & Busby, 2008). Poor diet quality is one contributing factor to the increased prevalence of overweight and obesity, as well as other chronic diseases such as heart disease and diabetes (McNaughton, Dunstan, Ball, Shaw, & Crawford, 2009; USDHHS, 2010; Wolongevicz, Zhu, Pencina, Kimokoti, Newby, D'Agostino, & Millen, 2010). Diet quality may be influenced by increases in variety and availability of foods over the past twenty years (Davis & Stewart, 2002), changes to the workforce and consequently household roles (Kant & Graubard, 2004; Mancino & Newman, 2007), improvements in food technology (Bowers, 2000; Cutler, Glaeser, & Shapiro, 2003), changes in eating habits (Lin & Frazão, 1999; Nielsen, Siega-Riz, & Popkin, 2002; Stewart, Blisard, & Jolliffe, 2006), and an increased desire for convenience by consumers (Rydell, Harnack, Oakes, Story, Jeffery & French, 2008; Stewart, Blisard, & Jolliffe, 2006). Over the past three decades, snacking and reliance on meals prepared outside of the home have increased while meal preparation at home has decreased (Kant & Graubard, 2004; Lin & Frazão, 1999;

Mancino & Newman, 2007; Nielsen, Siega-Riz, & Popkin, 2002; Rydell, Harnack, Oakes, Story, Jeffery & French, 2008). Decisions regarding food choice may relate to time scarcity, or the feeling that one does not have enough time to get all tasks accomplished. Lack of time has been indicated as a barrier to making healthy food choices in adults (Jabs, Devine, Bisogni, Farrell, Jastran, & Wethington, 2006). Rydel et al. (2008) surveyed individuals 16 years and older who ate fast food at least once per week and found that 92% chose fast food meals frequently because it was quick; forty-two percent cited choosing fast food meals because they were too busy to cook.

Transitions in life such as leaving home, marriage, divorce, and becoming a parent, have been associated with changes in health behaviors (Burke, Beilin, Dunbar, & Kevan, 2004; Devine, Connors, & Bisgoni, 1998; Felner, Farber, & Primavera, 1983). Tasks associated with raising a child and parenting may contribute further to one's feeling of time scarcity. This is supported by Jabs, et al. (2006) findings that mothers prioritized convenience and ease of preparation over nutrition so that they could use meal preparation time elsewhere. The Food Choice Process Model (Figure 1), proposed by Furst, Connors, Bisgoni, Sobal, & Falk (1996), examines the relationships among life course events (marriage, becoming a parent), health status, financial resources, time management, and personal values about food (taste preferences, nutrition, convenience, and availability). The model suggests that all of these aspects factor into and influence food choice, and within that choice an individual negotiates what values they are willing to sacrifice in place of other values (Furst, et al., 1996; Sobal & Bisgoni, 2009). For example, a single mother may value good nutrition and preparing meals for her family, but in order to spend time with her children, she is willing to give up some nutritional quality for more convenient, quicker meal options.

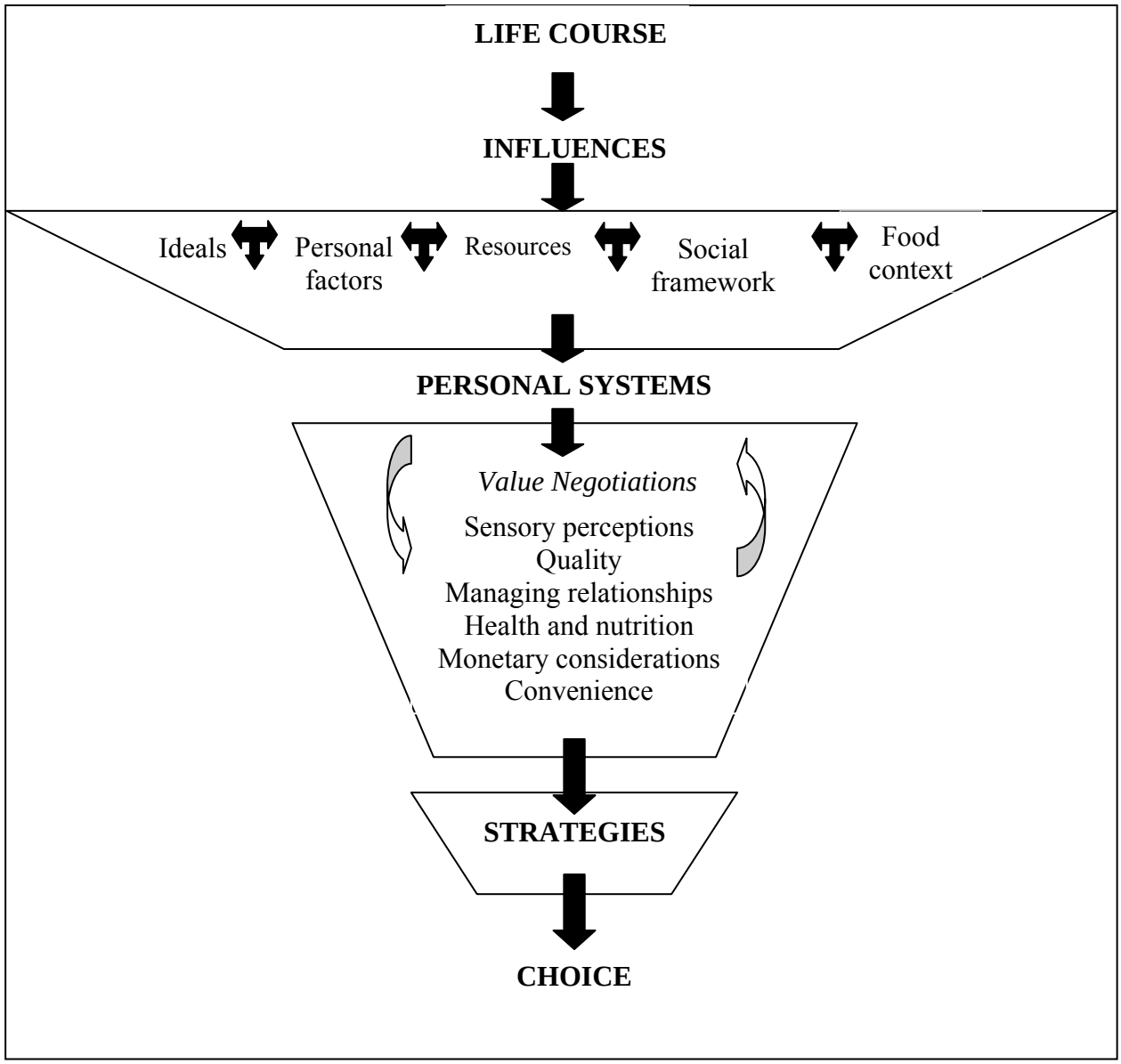


*Figure 1*. Food Choice Process Model. (Furst et al., 1996, p. 251)

According to the Food Choice Process Model, children present in the household should alter the food choices of adults through changes in personal value systems related to food choice. Research that compares nutrient intakes between adults with and without children present in the household are limited and provide conflicting results. Devine, Connors & Bisgoni (1998) suggested that children present in the household positively influence the dietary intake of adults due to a desire by parent's to serve balanced family meals. Other studies have suggested that

women with children consume significantly more energy, total fat, and saturated fat (Burke et al., 2004; Laroche, Hofer, & Davis, 2007). The dietary intake of adults with children in the household is an important area to investigate because parental dietary intake has been correlated to a child's dietary intake (Boutelle, Fulkerson, Neumark-Sztainer, Story, & French, 2007; Olson, Chung, Reckase, & Schoemer, 2009; Gibson, Wardle, & Watts, 1998; Oliveria, Ellison, Moore, Gillman, Garrahie, & Singer, 2002). Therefore, the purpose of this study is to determine whether adult dietary intake differs based on the presence of children in the household.

## Methods

A sample of 2,416 males and 2,488 females, ages 18 to 50 years, was selected from the National Health and Nutrition Examination Survey (NHANES) data gathered from 2005 to 2008. NHANES sampling is designed to be representative of the civilian, non-institutionalized United States population. This sample included only individuals who provided two non-consecutive days of 24-hour recall through in person and telephone interview, and identified whether children age 17 years or younger lived in the home.

The Food Choice Process Model suggests that life course and personal values influence food choices which determine nutrient intake, so the selection and recoding of variables were based on an Adapted Food Choice Process Model (Figure 2) and NHANES data availability. Life course variables selected from NHANES included the independent variable of interest, absence or presence of children in the household. NHANES did not specifically ask if children live in the home or how many children live in the home. However, a question within the Food Security Questionnaire asked participants to respond to the question only if they have children in the home aged 17 or under. Responses to this question were recoded into a dichotomous variable indicating presence or absence of children in the household. Another life course event is

marriage. Responses to a single question on marital status were categorized as "married or with partner" or "separated, divorced, widowed, or never married".

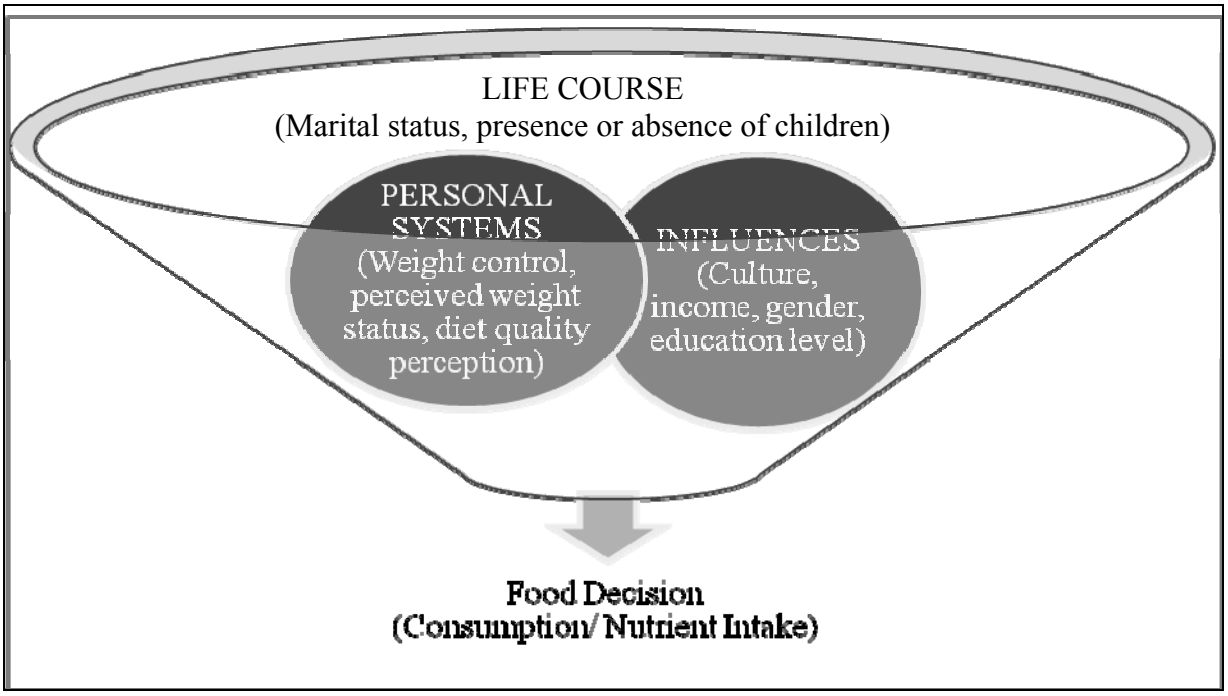


*Figure 2*. Adapted Food Choice Process Model. (Furst, et al., 1996, p. 251)

The model also suggests that gender, culture, and education level influence food choice. Race/ethnicity was used as a proxy for culture, and only the three largest racial groups were examined (Mexican American, Non-Hispanic White, and Non-Hispanic African-American). All other racial groups had a small number of respondents. Education level was recoded into three categories: "some high school or less", "high school diploma or GED", and "some college". Resources may include both time and money. However, time spent in food preparation was not captured in this version of NHANES. Therefore, the construct of resources is represented by family income expressed as a percent of the federal poverty threshold and categorized as1.30 or less, 1.31-1.85, or above 1.85 which is consistent with eligibility guidelines for food assistance programs (Food Research and Action Center, 2009).

Perception of diet quality was used to assess the construct of personal values and was based on responses to the following question: "In general, how healthy is {your/his/her} overall diet?" (CDC, NCHS, *NHANES 2007-2008 Questionnaire, Diet Behavior and Nutrition;* CDC, NCHS, *NHANES 2005-2006 Questionnaire, Diet Behavior and Nutrition*). Responses were recoded into "excellent, very good or good" or "fair or poor". Weight control and perceived weight status were also used to represent personal systems to indicate one's value of health and nutrition. Data for the weight control variable was based on feedback from the following question: "During the past 12 months, have {you/she/he} tried to lose weight?" Data for the perceived weight status variable is based on feedback from the following question: "{Do you/Does SP} consider {your/his/her}self now to be….overweight, underweight, or about the right weight?" (CDC, NCHS, *NHANES 2007-2008 Questionnaire, Weight History;* CDC, NCHS, *NHANES 2007-2008 Questionnaire, Weight History*; CDC, NCHS, *NHANES 2005-2006 Questionnaire, Weight History;* CDC, NCHS, *NHANES 2005-2006 Questionnaire, Weight History).* Possible responses include overweight, underweight, or about the right weight.

Dependent variables within the model representing food choice were the nutrient intakes. Estimates of subject's mean intake were calculated using two days of dietary recall for total energy, total fat, saturated fat, cholesterol, protein, carbohydrate, fiber, sodium, calcium, and iron. Percentages of calories from total fat, saturated fat, protein, and carbohydrates were also calculated. These nutrients were chosen since they are specifically addressed in the *Dietary Guidelines for Americans, 2005* (USDHHS & USDA, 2005). Mean intakes and percentages were compared to each nutrient's National Academy of the Sciences recommendation (AMDR for total fat, saturated fat, protein, and carbohydrate; AI for fiber and calcium; UL for sodium; EAR for iron) with the exception of cholesterol which was compared to the USDA's *Dietary*

*Guidelines for Americans, 2005* and *2010* recommendation (Food and Nutrition Board, Institute of Medicine, 2005; USDHHS & USDA, 2005; USDHHS & USDA, 2010). These nutrients were recoded to be dichotomous, categorical variables based on whether the individual was meeting or not meeting the recommendations based on gender and age.

**Statistical Analyses**

Data management and recoding was completed using SAS (version 9.1, SAS Institute Inc, Cary, NC). All other statistical analyses were completed using SUDAAN (version 10.0.1, 2010, Research Triangle Institute, Research Triangle Park, NC) to control for NHANES 2005-2006 and NHANES 2007-2008 sampling weights and the complexity of the survey design. Due to the different gender roles in the family, data from males and females were analyzed separately. The CROSSTAB and DESCRIPT procedures in SUDAAN were used to compute means, standard errors, distribution ranges, frequencies, and cross tabulation statistics. Using linear regression models and the PROC REGRESS procedure in SUDAAN, differences in mean nutrient intakes of total energy, protein, carbohydrate, fiber, total fat, saturated fat, cholesterol, calcium, iron, and sodium were compared by child presence while controlling for selected variables that represented the Food Choice Process Model (marital status, gender, race, education level, income level, diet perception, weight control, and weight perception). Then, using a logistic regression model and the PROC LOGISTIC procedure in SUDAAN, adherence to the AMDR for protein, carbohydrate, total fat, and saturated fat, meeting the AI for fiber and calcium, not exceeding the UL for sodium, and not exceeding the *Dietary Guideline* for cholesterol was compared by child presence while controlling for the same selected variables. Odd ratios and confidence intervals were generated from each model and used to describe the

relationship between presence or absence of children and meeting of nutrient recommendations. Tests with an $\alpha \leq 0.05$ or with a 95% confidence interval were considered significant.

## Results

Table 1 describes the sample population by gender and presence of children. The percentage of men with children who were also married (87%) differed significantly from men without children (49.2%) present in the home ($p<0.01$). The two male populations were also significantly different in regards to race and income level. A similar pattern was found in women with children where 75.4% were married versus 51.9% of women without children who are married ($p<0.01$). The female populations were also significantly different in regards to race, education level, and income. Surprisingly, the three variables selected to represent personal values (diet perception, weight control, and weight perception) did not differ based on whether a child was present in the household for both genders.

Table 2 shows the mean intakes of the selected nutrients for males and females based on presence of children in the household. After adjusting for selected factors within the model, energy intake did not differ between males with and without children present. Among the nutrients tested, only fiber and sodium intakes were significantly different, and differences were not clinically significant. Energy intake did not differ between females with and without children present. However, females without children present had significantly higher fiber intakes compares to females with children ($p=0.03$).

Table 3 shows the percentage of males and females meeting nutrient recommendations based on presence of children. A high percentage of males and females had protein intakes within the AMDR, and slightly more than half of the adult population had intakes of total fat and carbohydrate that fell within the AMDR. Most all males regardless of child presence met the

Table 1:

*Demographics and Characteristics of U.S. Adults Based on Presence or Absence of Children in the Household*

| | Males | | | Females | | |
|---|---|---|---|---|---|---|
| | Children Absent n=1018 | Children Present n=1398 | p-value* | Children Absent n=885 | Children Present n=1603 | p-value* |
| LIFE COURSE | | | | | | |
| Marital Status | | | | | | |
| Married or with partner | 49.2 | 87.0 | <0.01* | 51.9 | 75.4 | <0.01* |
| Separated, widowed, divorced or never married | 50.8 | 13.0 | | 48.1 | 24.6 | |
| INFLUENCES & RESOURCES | | | | | | |
| Race | | | | | | |
| Mexican-American | 7.5 | 17.1 | <0.01* | 5.5 | 13.5 | <0.01* |
| Non-Hispanic White | 78.5 | 70.5 | | 80.6 | 70.9 | |
| African American | 14.0 | 12.4 | | 13.9 | 15.7 | |
| Education | | | | | | |
| Some high school or less | 15.3 | 21.6 | 0.05 | 15.2 | 22.4 | <0.01* |
| HS diploma or GED | 23.7 | 23.3 | | 23.6 | 25.9 | |
| Some college | 61.0 | 55.1 | | 61.2 | 51.7 | |
| Income Level | | | | | | |
| <1.30 | 15.7 | 21.7 | <0.01* | 20.8 | 27.3 | 0.19 |
| 1.30-1.85 | 7.2 | 11.5 | | 9.8 | 10.3 | |
| >1.85 | 77.1 | 66.8 | | 69.4 | 62.4 | |
| PERSONAL VALUES | | | | | | |
| Diet Perception | | | | | | |
| Fair or poor | 35.5 | 32.4 | 0.29 | 30.5 | 29.9 | 0.83 |
| Excellent, very good or good | 64.5 | 67.6 | | 69.5 | 70.1 | |
| Weight control | | | | | | |
| Yes | 30.8 | 28.5 | 0.47 | 49.9 | 50.7 | 0.83 |
| No | 69.2 | 71.5 | | 50.1 | 49.3 | |
| Weight perception | | | | | | |
| Overweight | 42.1 | 49.1 | 0.10 | 57.2 | 62.9 | 0.15 |
| Underweight | 6.8 | 6.4 | | 3.2 | 3.0 | |
| About right weight | 51.1 | 44.5 | | 39.6 | 34.1 | |

*p<0.05 indicating statistically significant finding after adjusting for marital status, race, education, income level, diet perception, weight control, and weight perception.

Table 2:

*Nutrient Intakes of U.S. Adults Based on Presence or Absence of Children in the Household*

| Nutrient | Males | | | Females | | |
|---|---|---|---|---|---|---|
| | Children Absent n=1018 | Children Present n=1398 | p-value* | Children Absent n=885 | Children Present n=1603 | p-value* |
| | Mean (SE) | Mean (SE) | | Mean (SE) | Mean (SE) | |
| Energy | 2659.3 (46.2) | 2610.2 (39.8) | 0.41 | 1847.1 (29.2) | 1807.1 (23.5) | 0.48 |
| Protein (% of total calories) | 16.2 (0.2) | 16.2 (0.2) | 0.64 | 15.6 (0.2) | 16.0 (0.2) | 0.87 |
| Carbohydrate (% of total calories) | 47.5 (0.5) | 48.3 (0.5) | 0.84 | 50.0 (0.4) | 50.3 (0.5) | 0.28 |
| Fiber (g) | 17.5 (0.5) | 17.2 (0.5) | 0.04* | 14.5 (0.5) | 13.7 (0.4) | 0.03* |
| Total Fat (% of total calories) | 33.3 (0.3) | 33.4 (0.3) | 0.11 | 33.3 (0.3) | 33.4 (0.4) | 0.21 |
| Saturated Fatty Acids (% of total calories) | 11.2 (0.2) | 11.1 (0.1) | 0.12 | 11.1 (0.1) | 11.1 (0.1) | 0.07 |
| Cholesterol (mg) | 355.4 (8.1) | 370.0 (8.7) | 0.25 | 231.0 (6.7) | 241.4 (4.7) | 0.90 |
| Calcium (mg) | 1102.5 (34.6) | 1094.7 (22.3) | 0.56 | 875.4 (23.7) | 839.5 (22.9) | 0.28 |
| Iron (mg) | 19.0 (0.4) | 18.5 (0.4) | 0.54 | 14.0 (0.3) | 13.6 (0.3) | 0.10 |
| Sodium (mg) | 4385.0 (83.8) | 4167.1 (81.7) | 0.03* | 3017.9 (53.6) | 2990.9 (47.6) | 0.92 |

*$p<0.05$ indicating statistically significant finding after adjusting for marital status, race, education, income level, diet perception, weight control, and weight perception.

Table 3:

*Percentage of U.S. Adults Meeting Dietary Recommendations Based on Presence or Absence of Children in the Household*

| Nutrient | Criteria[a] | Males | | | Females | | |
|---|---|---|---|---|---|---|---|
| | | Children Absent n=1018 | Children Present n=1398 | OR (95% CI)* | Children Absent n=885 | Children Present n=1603 | OR (95% CI)* |
| | | % | % | | % | % | |
| Protein (AMDR) | 10-35% of total calories | 96.6 | 96.7 | 1.1 (0.5, 2.3) | 93.7 | 94.3 | 1.2 (0.7, 2.0) |
| Carbohydrate (AMDR) | 45-65% of total calories | 55.2 | 61.7 | 1.1 (0.8, 1.6) | 65.7 | 67.2 | 1.0 (0.7, 1.4) |
| Fiber (AI) | 38g (males) 25g (females) | 4.3 | 3.1 | 0.7 (0.4, 1.3) | 8.8 | 6.1 | 0.5 (0.3, 0.9) |
| Total Fat (AMDR) | 20-35% of total calories | 58.6 | 57.3 | 1.2 (0.9, 1.5) | 55.2 | 55.9 | 1.0 (0.8, 1.4) |
| Saturated Fatty Acids (AMDR) | <10% calories | 36.1 | 36.3 | 0.8 (0.5, 1.2) | 39.1 | 39.1 | 0.9 (0.7, 1.2) |
| Cholesterol (2005 DG) | <300mg | 50.2 | 47.4 | 0.9 (0.7, 1.2) | 75.7 | 72.4 | 1.1 (0.8, 1.5) |
| Calcium (AI) | 1000mg | 49.5 | 46.5 | 1.0 (0.7, 1.3) | 31.8 | 30.1 | 0.9 (0.6, 1.3) |
| Iron (EAR) | 6.0 (males) 8.1 (females) | 98.7 | 98.4 | 0.6 (0.2, 2.0) | 80.4 | 84.0 | 1.4 (1.0, 2.0) |
| Sodium (UL) | <2300mg | 10.3 | 10.6 | 1.0 (0.6, 1.5) | 28.2 | 30.1 | 1.0 (0.7, 1.4) |

*OR within a 95% confidence interval indicating statistically significant finding after adjusting for marital status, race, education, income level, diet perception, weight control, and weight perception.

[a] Criteria listed are for adults 19-50 years. For adults 18 years old, some recommendations differed, and the following criteria were used in place of the criteria above: AMDR for protein of 10-30% of total calories, AMDR for total fat of 25-35% of total, AI for calcium of 1300mg, AI for fiber of 26g (females), EAR for iron of 7.9mg (females), and EAR for iron of 7.7mg (males) (Food and Nutrition Board, Institute of Medicine, 2005).

EAR for iron intake, but females without children were less likely to meet the EAR for iron compared to females with children. The AMDR for saturated fat and the AI for fiber was met by very few males and females regardless of child presence, and the UL for sodium was exceeded by most all males and females regardless of child presence. Females with children were significantly less likely to meet the AI for fiber intake compared to females without children (95% CI: 0.3, 0.9), and calcium intake was met by less than one third of females regardless of child presence.

## Discussion

The results of this study suggest that presence of children in the household has little influence on adults' dietary intakes, and are contrary to the findings of Burke et al. (2004) and Laroche et al. (2007) which suggested that adult females with children consumed significantly more energy, total fat, and saturated fat. In this study, mean total fat and saturated fat intakes were similar regardless of child presence and gender, and few significant nutrient differences in either gender were found when examined by child presence.

These results are surprising when examined using the Food Choice Process Model because adults with and without children present have different life courses and influences, so one would expect personal values systems that influence food choice to change based on presence of children. However, in this study, personal value systems (diet perception, weight control, and weight perception) were similar for males and females with and without children present (Table 1), but all were found to be significant predictors of nutrition intake in the models (data not shown). This suggests that personal value systems are leading both adults with and without children to choose similar foods and thus have similar nutrient intakes.

Several factors should be considered when examining this study's findings. First, a limitation of this study was the inability to gather the number of children within the households of adult subjects. NHANES data only indicated whether children were present and did not attempt to quantify how many children were present or ages of children present. Had this data been available, dietary intake of those with children in the household could have been examined further based on number of children and ages of children may have identified relationships between these groups. Second, this research examined nutrient intake rather than food group intake. Although nutrient intakes were similar, adults without children in the home may be consuming different foods to obtain these nutrients compared to adults with children in the home. Resources for food intake include income and time, but this NHANES data did not examine any aspect of time scarcity. Females without children in the household tended to be of upper income levels and unmarried, so they may be purchasing more prepared foods or eating away from home more frequently. It is possible that looking at the number of vegetable or low-fat dairy servings may be a better indicator of diet quality and differences would be seen between groups.

## Conclusion

After adjusting for selected factors from the Adapted Food Choice Model, few differences existed in the nutrient intake of adults with and without children in the household. This may be due to little difference in personal value systems related to food between adults with and without children present in the household. Future research examining other personal value system variables and time use variables could suggest differences between these two populations.

Overall dietary intake for all adults needs improvement specifically to increase fiber and calcium intakes and to decrease sodium intakes. Saturated fat intakes for many adults are not within the AMDR, regardless of child presence. This study's findings support previous research that American adults' diet could be improved specifically in regards to saturated fat, fiber, and sodium intakes. Practitioners should encourage all adults to adhere to dietary recommendations by using tools such as MyPyramid (USDA, CNPP, 2005) and the *Dietary Guidelines for Americans* (USDHHS & USDA, 2010), but should also examine food choice influences in all adults.

## References


Boutelle, K.N., Fulkerson, J.A., Neumark-Sztainer, D., Story, M., & French, S.A. (2007). Fast food for family meals: Relationships with parent and adolescent food intake, home food availability and weight status. *Public Health Nutrition*, 10(1), 16-23. doi: 10.1017/S136898000721794X

Bowers, D.E. (2000, January). Cooking trends echo the changing roles of women. *Food Review*, 23(1), 23-25. Retrieved from: http://www.ers.usda.gov/publications/foodreview/jan2000/frjan2000d.pdf

Burke, V., Beilin, L.J., Dunbar, D., & Kevan, M. (2004). Changes in health-related behaviours and cardiovascular risk factors in young adults: associations with living with a partner. *Preventive Medicine*, 39, 722-730. doi: 10.1016/j.ypmed.2004.02.038

Centers for Disease Control, National Center for Health Statistics (2010). NHANES 2007-08 demographic, examination, and questionnaire files [data files and code books]. Retrieved from http://www.cdc.gov/nchs/nhanes/nhanes2007-2008/quex07_08.htm

Centers for Disease Control, National Center for Health Statistics (2008). NHANES 2005-06 demographic, examination, and questionnaire files [data files and code books]. Retrieved from http://www.cdc.gov/nchs/nhanes/nhanes2005-2006/nhanes05_06.htm

Centers for Disease Control, National Center for Health Statistics. *NHANES 2007-2008 Questionnaire, Weight History.* Retrieved from http://www.cdc.gov/nchs/data/nhanes/nhanes_07_08/whq07_08_eng.pdf

Centers for Disease Control, National Center for Health Statistics. *NHANES 2005-2006 Questionnaire, Weight History.* Retrieved from http://www.cdc.gov/nchs/data/nhanes/nhanes_05_06/sp_whq_d.pdf

Cutler, D.M., Glaeser, E.L., & Shapiro, J.M. (2003). Why have Americans become more obese?, *Journal of Economic Perspectives*, 17(3), 93-118. Retrieved from http://faculty.chicagobooth.edu/jesse.shapiro/research/obesity.pdf

Davis, D.E., & Stewart, H. (2002, Spring). Changing consumer demands create opportunities for U.S. food system. *Food Review*, 25(1), 19-23.Retrieved from http://www.ers.usda.gov/publications/FoodReview/May2002/frvol25i1d.pdf

Devine C.W., Connors M., & Bisogni C.A.. Life-course influences on fruit and vegetable trajectories: qualitative analysis of food choices (1998). *Journal of Nutrition Education*, 30, 361-370. doi: 10.1016/S0022-3182(98)70358-9

Felner R.D., Farber S.S., & Primavera J. (1983). Transition and stressful life events: a model for primary prevention. *Preventive psychology: theory, research, and practice*. New York: Pergamon; 42-67.

Furst, T., Connors, M., Bisgoni, C.A., Sobal, J. & Falk, L.W. (1996). Food Choice: A conceptual model of the process. *Appetite*, 26, 247-266. doi: 10.1006/appe.1996.0019

Food Research and Action Center (2009). Income Guidelines and Reimbursement Rates for Federal Nutrition Programs. Retrieved from Food Research and Action Center website: http://www.frac.org/pdf/rates.PDF

Gibson, E.L., Wardle, J., & Watts, C.J. (1998). Fruit and vegetable consumption, nutritional knowledge and beliefs in mothers and children. *Appetite*, 31(2), 205-228. doi: 10.1006/appe.1998.0180

Guenther, P.M., Juan, W.F., Lino, M., Hiza, H.A., Fungwe, T., & Lucas, R. (2008) *Diet quality of low income and higher income Americans in 2003-04 as measured by the Healthy Eating Index-2005* (Nutrition Insight 42). Retrieved from U.S. Department of Agriculture website: http://www.cnpp.usda.gov/Publications/NutritionInsights/insight42.pdf

Jabs, J., Devine, C.M., Bisogni, C.A., Farrell, T.J., Jastran, M., & Wethington, E. (2006). Trying to find the quickest way: employed mothers' constructions of time for food. *Journal of Nutrition Education and Behavior*, 39, 18-25. doi: 10.1016/j.jneb.2006.08.011

Kant, A.K., & Graubard, B.I. (2003). Eating out in America, 1987-2000: trends and nutritional correlates. *Preventive Medicine*, 38, 243-249. doi: 10.1016/j.ypmed.2003.10.004

Laroche H.H., Hofer T.P., & Davis M.M. (2007). Adult fat intake associated with the presence of children in households: findings from NHANES III. *Journal of the American Board of Family Medicine*, 20, 9-15. doi: 10.3122/jabfm.2007.01.060085

Lin, B., & Frazão, E. (1999). *Away-from-home foods increasingly important to quality of American diet* (Bulletin No. 749). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/aib749/aib749.pdf

Mancino, L., & Newman, C. (2007). *Who Has Time To Cook? How Family Resources Influence Preparation* (ERR-40). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/err40/err40.pdf

McNaughton, S.A., Dunstan, D.W., Ball, K., Shaw, J., & Crawford, D. (2009). *Dietary quality is associated with diabetes and cardio-metabolic risk factors*, 139, 734-742. doi: 10.3945/jn.108.096784

Nielsen, S. J., Siega-Riz, A. M., & Popkin, B. M. (2002). Trends in food locations and sources among adolescents and young adults. *Preventive Medicine*, 35, 107-113. doi: 10.1006/pmed.2002.1037

Oliveria, S.A., Ellison, R.C., Moore, L.L., Gillman, M.W., Garrahie, E.J., & Singer, M.R. (1992). Parent-child relationships in nutrient intake: the Framingham Children's Study.

*American Journal of Clinical Nutrition*, 56, 593-598. Retrieved from http://www.ajcn.org/cgi/reprint/56/3/593

Olson, B.H., Chung, K.R., Reckase, M., & Schoemer, S. (2009). Parental role on dairy intake in children, and their role in child calcium-fortified food use. *Journal of Nutrition Education and Behavior*, 41(1), 53-57. doi: 10.1016/j.jneb.2008.03.005

Food and Nutrition Board, Institute of Medicine. *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids*. Washington, DC: National Academies Press, 2005.

Rydell, S.A., Harnack, L.J., Oakes, M., Story, J.M., Jeffrey, R.W., & French, S.A. (2008). Why eat at fast-food restaurants: Reported reasons among frequent consumers. *Journal of the American Dietetic Association*, 108, 2066-2070. doi: 10.1016/j.jada.2008.09.008

Sobal, J., & Bisgoni, C.A. (2009). Constructing food choice decisions. *Annals of Behavioral Medicine*, 38, S37-S46. doi: 10.1007/s12160-009-9124-5

Stewart H., Blisard, N., & Jolliffe, D.S. (2006). *Let's Eat Out: Americans Weight Taste, Convenience, and Nutrition* (EIB-19). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/eib19/eib19.pdf

U.S. Department of Agriculture, Center for Nutrition Policy and Promotion. (2005). *My Pyramid: USDA's New Food Guidance System* [powerpoint]. Retrieved from http://www.mypyramid.gov/professionals/index.html

U.S. Department of Health and Human Services and Department of Agriculture (2005). *Dietary guidelines for Americans, 2005*. Retrieved from http://www.health.gov/dietaryguidelines/dga2005/document/pdf/DGA2005.pdf

U.S. Department of Health and Human Services and Department of Agriculture (2010). *The Surgeon General's Vision for a Healthy Fit Nation*. Retrieved from http://www.surgeongeneral.gov/library/obesityvision/obesityvision2010.pdf

Wells, H.F., & Busby, J.C. (2008). *Dietary Assessment of Major Trends in U.S. Food Consumption, 1970-2005* (EIB No.33). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/Publications/EIB33/EIB33.pdf

Wolongevicz, D.M., Zhu, L., Pencina, M.J., Kimokoti, R.W., Newby, P.K., D'Agostino, R.B., & Millen, B.E. (2010). *Diet quality and obesity in women: the Framingham Nutrition Studies*. 103, 1223-1229. Doi: 35400018105610.0170

# CHAPTER 3

## CHILD PRESENCE AND FAFH FREQUENCY IMPACTS FEMALE DIETARY INTAKE AND ADEQUACY

Although resources such as the *Dietary Guidelines for Americans* (USDHHS & USDA, 2010) and MyPyramid (USDA, CNPP, 2005) exist to promote optimal dietary intake for health, U.S. adults consume too few fruits, vegetables, whole grains, and low-fat dairy servings (Guenther, Juan, Lino, Hiza, Fungwe, & Lucas, 2008; Nielsen, Siega-Riz, & Popkin, 2002; Wells & Busby, 2008). Additionally, intake of added fats, added sugars, and total energy has increased over the past three decades (Guenther et al., 2008, Lin & Frazão, 1999, Wells & Busby, 2008). Factors that may be contributing to poor dietary intake include increased availability of foods (Davis & Stewart, 2002), improved technology to aid in food preparation and preservation (Bowers, 2000; Cutler, Glass, & Shapiro, 2003), and an increased desire for convenience by consumers to purchase food prepared outside of the home (Stewart, Blissard, & Joliffe, 2006; Rydell, Harnack, Oakes, Story, Jeffrey, & French, 2008). Food away from home (FAFH) is defined in current research and USDA reports as food prepared outside of the home and includes fast food, pizza delivery, take-out, restaurants and cafeterias. Americans' reliance on FAFH for meals and snacks has increased over the past three decades while home meal preparation has decreased (Lin & Frazão, 1997; Lin & Frazão, 1999; Nielsen, Siega-Riz, & Popkin, 2002; Stewart, Blissard, & Joliffe, 2006). Adults who frequently consume FAFH have higher intakes of total energy, total fat, saturated fat, cholesterol, and sodium and lower intakes

of fiber, calcium, Vitamin A, and Vitamin C than adults who consume fast food less than two times per week (Bowman & Vineyard, 2004; Clemens, Slawson, and Klesges, 1999; French, Harnack, & Jeffrey, 2000; Jeffrey & French, 1998; Paeratkul, Ferdinand, Champagne, Ryan, & Bray, 2003; Pereira, Karatashov, Ebbeling, Van Horn, Slattery, Jacobs, & Ludwig, 2005) . Increased consumption of FAFH is of concern because studies suggest that individuals who eat more than two meals each week prepared outside of the home are more likely to be overweight or obese, have higher body weights, and higher body mass indexes (BMI) compared to those who eat two or less meals away from home each week (Duffy, Gordon-Larsen, Jacobs, Williams & Popkin, 2007; French, Harnack, & Jeffrey, 2000; Pereira et al., 2005; Schröder, Fito, & Covas, 2007; Smith, McNaughton, Gall, Blizzard, Dwyer, & Venn, 2009).

Factors contributing to increased FAFH consumption include work force changes, household roles, and household income (Kant & Graubard, 2004; Mancino & Newman, 2007). Mancino and Newman suggested that employment has had the greatest impact on home meal preparation and most notably for households where the head female is employed (2007). As of 2008, 71% of mothers worked (US Department of Labor, 2009) compared to 34% in 1975 (US Department of Labor, *Report on the American Workforce,* 2001). Consequently, household roles have changed, and meal preparation time, which was estimated to consume 15 to 18 hours per week in 1967 (US Department of Labor, *Working in the 21st Century*, 2001), has decreased to approximately 30 to 55 minutes per day. An increase in work outside of the home may contribute to time scarcity or the feeling that one cannot accomplish all that needs to be done in a 24-hour period (Jabs, Devine, Bisogni, Farrell, Jastran, & Wethington, 2006). Time scarcity has been identified as a barrier to making healthy food choices and contributes to greater fast food

and FAFH consumption (Devine, Farrell, Blake, Jastran, Wethington, & Bisgoni, 2009; Jabs et al., 2006).

Bryant and Zick's theory on time allocation usage (time constraint equation: T=M+H+L) where total time (T) is the sum of work for pay outside the home (M), work within the home (H) such as meal preparation, and leisure time (L) supports this idea. The fundamental constraint within Bryant and Zick's time equation is that total time each day cannot be increased. Therefore, if more time is allocated to work outside of the home, then either work at home, such as cooking dinner or grocery shopping, or leisure time must be decreased (Bryant & Zick, 2006). Becker's (1965) household production model further suggests that consumers will purchase goods and services if the goods and services will provide them more time to allocate elsewhere if money is available and if the good or service is seen as an acceptable substitute. As household income increases due to work outside of the home, families may have more ability to buy commodities or services that will reduce work time at home, such as buying FAFH to reduce meal preparation work. In fact, Blisard, Variyam, & Cromartie (2003) estimated that for each 10% increase in income there is a 4% increase in FAFH consumption.

Because food decisions are not strictly the result of economics and time constraints, the Food Choice Process Model has been used to more thoroughly examine food choice by taking into account economic, psychological, and behavioral viewpoints. Proposed by Furst, Connors, Bisgoni, Sobal, & Falk (1996), this model examines how personal influences (ethnicity, gender), life course events (marriage, becoming a parent), health status, financial resources, time allocation and management, and personal values about food (taste preferences, nutrition, convenience, and availability) interact and influence food choice. The model also examines how an individual negotiates what values (nutrition, cost, convenience) they are willing to sacrifice in

place of other values. To simplify food decisions, a person may develop normal scripts or coping strategies they follow routinely to assist in value negotiations (Sobal & Bisgoni, 2009). For example, an individual who values nutritious meals may opt for less healthy FAFH when feelings of time scarcity are great. The decision to opt for FAFH in this scenario values convenience over nutrition and is a coping strategy that may be used again.

A life event that contributes further to one's feeling of time scarcity is becoming a parent (Jabs et al., 2006). This life course event has also been associated with changes in eating habits (Burke, Beilin, Dunbar, & Kevan, 2004; Devine, Connors, & Bisgoni, 1998; Felner, Farber, & Primavera, 1983). Popular coping strategies identified by Devine et al. (2009) that parents use include eating fast food, purchasing meals from vending machines, eating while driving, and choosing more frozen and prepared meals (Devine et al., 2009). Limited research exists on the relationship between FAFH and dietary intake among parents. Examining the impact that FAFH consumption has on the dietary intake of adults with children is important because studies have correlated parental dietary intake to a child's dietary intake (Boutelle, Fulkerson, Neumark-Sztainer, Story & French, 2007; Olson, Chung, Reckase, & Schoemer, 2009; Gibson, Wardle, & Watts, 1998; Oliveria, Ellison, Moore, Gillman, Garrahie, & Singer, 2002). Therefore, the purpose of this study is to determine whether adult dietary intake differs based on frequency of FAFH consumption and the presence of children in the household.

## Methods

A sample of adults between the ages of 18 to 50 years was selected from data gathered between 2005-2008 on the National Health and Nutrition Examination Survey (NHANES). The sample consisted of 2,416 males and 2,488 females and included only individuals who provided two non-consecutive days of dietary recall information and who identified whether children 17

years or younger lived in the household. Selection and recoding of variables from this sample was based upon NHANES data availability and an Adapted Food Choice Process Model with Coping Strategies (Figure 3) which attempted to examine life course events, influences, personal values, and coping strategies used to make food choices.

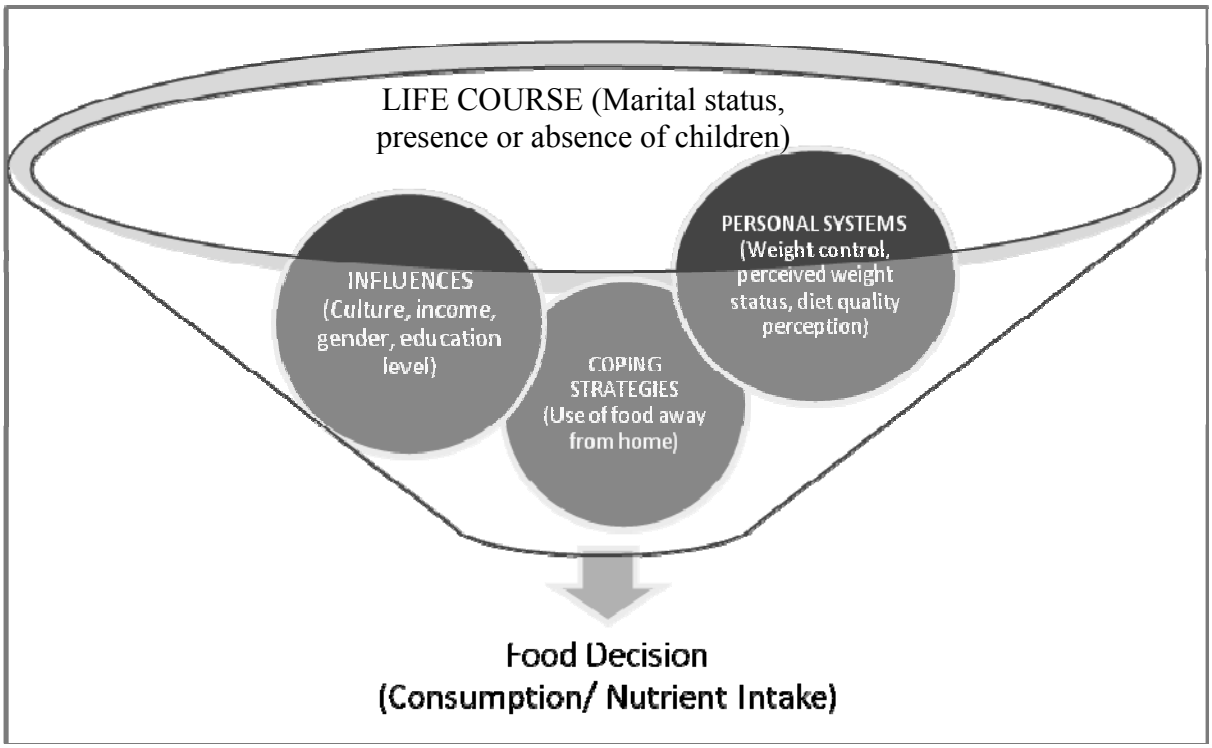


*Figure 3*. Adapted Food Choice Process Model with Coping Strategies. (Furst, et al., 1996, p. 251)

Life course variables chosen included the independent variable of interest, absence or presence of children in the home. Because NHANES does not directly ask if children reside in the home, individuals with children 17 years or younger in the household were identified based on responses to a question within the Food Security Questionnaire, and responses were recoded into a dichotomous variable indicating presence or absence of children in the home. Marital status also served as a life course variable. Responses to demographic questions about marital status were recoded as either "married or with partner" or "separated, divorced, widowed, or never married." Influence and resource variables included race/ethnicity, education, and income

level. Race/ethnicity served as a proxy for cultural influences, and only responses for the three largest racial groups (Mexican American, Non-Hispanic White, Non-Hispanic African-American) were used. All other groups had limited responses. Education level was recoded into "some high school or less", "high school diploma or GED", and "some college". Income level was used to assess financial resources and was based upon family income expressed as a percent of the federal poverty threshold. Income level categories were based upon eligibility guidelines for food assistance programs (1.30 of the federal poverty level or less, 1.31-1.85 of the federal poverty level, above 1.85 of the federal poverty level) (Food Research and Action Center, 2009). Resources could also include time, but time constraints couldn't be ascertained due the lack of data gathered in this wave of NHANES.

Personal value variables examined included diet perception, weight control, and weight perception. Diet perception was based on responses to a question within the Diet Behavior and Nutrition Questionnaire that asked individuals to assess the overall quality of their diet (CDC, NCHS, *NHANES 2007-2008 Questionnaire, Diet Behavior and Nutrition;* CDC, NCHS, *NHANES 2005-2006 Questionnaire, Diet Behavior and Nutrition*). Responses were recoded into two categories: "excellent/very good/good" and "fair/poor". Weight control and weight perception variables were based on feedback from questions within the Weight History Questionnaire. Weight control was based on responses from a question that asked if individual's had tried to lose weight within the past 12 months (CDC, NCHS, *NHANES 2007-2008 Questionnaire, Weight History;* CDC, NCHS, *NHANES 2007-2008 Questionnaire, Weight History*; CDC, NCHS, *NHANES 2005-2006 Questionnaire, Weight History;* CDC, NCHS, *NHANES 2005-2006 Questionnaire, Weight History).* Weight perception was based on feedback

on how one would classify their weight status. Responses for the weight perception variable were recoded into "underweight or about the right weight" and "overweight".

Coping strategies used in food choice decisions can include a variety of techniques, but for the purposes of this study, FAFH frequency was the only one examined and was an additional independent variable of interest. FAFH frequency was determined based on answers to the following question: "On average, how many meals per week do you get that were not prepared at home? Please include meals from both dine-in and carry out restaurants, restaurants that deliver food to your home, cafeterias, fast-food places, food courts, meals prepared at a grocery store, and meals from vending machines." (CDC, NCHS, *NHANES 2007-2008 Questionnaire, Diet Behavior and Nutrition*; CDC, NCHS, *NHANES 2005-2006 Questionnaire, Diet Behavior and Nutrition*). Survey participants were encouraged to report frequency, and responses were recoded based upon frequency definitions use in current research. "Low" frequency was defined as consumption of one or fewer meals prepared outside of the home per week, and "high" frequency was defined as two or more meals prepared outside of the home per week which is consistent with the definitions used in other research (Schröder, Fito, & Covas, 2007; Smith et al., 2009). "Never" or "less than weekly" responses were recoded as "low"; "refused" and "don't know" responses were recoded as missing.

Nutrient intakes represented the concept of food choice in the model and were the dependent variables of interest in this study. Recommendations at the time the data were gathered were used for comparison purposes, and only specific nutrients highlighted in the *Dietary Guidelines for Americans* (USDHHS & USDA, 2010; USDHHS & USDA, 2005) were chosen to be included in this study. Nutrient intakes from two non-consecutive 24-hour periods were averaged together to calculate each individual's mean nutrient intake for total energy, total

fat, saturated fat, cholesterol, protein, carbohydrate, fiber, sodium, calcium, and iron. For total fat, saturated fat, carbohydrate and protein, a percentage of calories was calculated. Each mean nutrient intake and percentage was then compared to the National Academy of Sciences (NAS) recommendation (AMDR for total fat, saturated fat, protein, and carbohydrate; meeting the AI for fiber and calcium; not exceeding the UL for sodium; meeting the EAR for iron) (Food and Nutrition Board, Institute of Medicine, 2005). The exception was cholesterol which was compared to the USDA's *Dietary Guidelines for Americans* recommendation (USDHHS & USDA, 2010; USDHHS & USDA, 2005). Each individual's mean nutrient intake and percentage was recoded into dichotomous, categorical variables based on whether the recommendation was met based on gender and age. The two categorical variables were "meeting" which indicated intake was above the EAR, AI or falling within the AMDR or "not meeting" which indicated intake was below the EAR, AI or falling above or below the AMDR.

**Statistical Analyses**

SAS (version 9.1, SAS Institute Inc, Cary, NC) was used for all data recoding and management. SUDAAN (version 10.0.1, 2010, Research Triangle Institute, Research Triangle Park, NC) was used to complete all descriptive and inferential analyses to control for NHANES 2005-2008 sampling weights. Male and female data were analyzed separately due to varying household roles and differences between genders. Chi-square tests were used to compare high versus low consumption frequency of FAFH based on child presence for males and females. Using the PROC REGRESS procedure in SUDAAN, individual linear regression models were used to compare differences in mean nutrient intakes for total energy, protein, carbohydrate, fiber, total fat, saturated fat, cholesterol, calcium, iron, and sodium when examined by child presence and FAFH frequency and while controlling for selected variables that represented the

Food Choice Process Model (marital status, gender, race, education level, income level, diet perception, weight control, and weight perception). Tests with an $\alpha \leq 0.05$ were considered significant. The PROC LOGISTIC procedure in SUDAAN was used on logistic regression models to compare adherence to the AMDR for protein, carbohydrate, total fat, and saturated fat, meeting the AI for fiber and calcium, not exceeding the UL for sodium, and not exceeding the *Dietary Guideline* for cholesterol when examined by child presence and FAFH frequency while controlling for the same selected variables. Odds ratios and confidence intervals from each model were then used to describe relationships between presence of children in the home, FAFH frequency, and adherence of dietary recommendations. Tests with a 95% confidence interval were considered significant.

## Results

Tables 4 and 5 describe the sample population by gender, presence of children, and FAFH frequency. The proportion of males with high FAFH frequency without children in the home was significantly different from males with children present (80.2% versus 74.4%, respectively, $p<0.01$). Frequency of FAFH for males without children differed by income, diet perception, and weight control. Frequency of FAFH consumption for males with children present in the household differed by marital status, race, education level, income level, diet perception, and weight perception. The proportion of females with high FAFH frequency without children present in the home was significantly different from females with children present (71.7% versus 62.9%, respectively, $p<0.01$). For females without children in the household, frequency of FAFH consumption differed based on education and income level only. For females with children in the household, frequency of FAFH consumption differed based on race, education, income level, and diet perception.

Table 4:

*Demographics and Characteristics of U.S. Adult Males Based on Presence of Children in the Household and Consumption Frequency of Food Away from Home*

| | Males | | | | | |
|---|---|---|---|---|---|---|
| | Children Absent n=1018 | | p-value* | Children Present n=1398 | | p-value* |
| | High n=787 | Low n=231 | | High n=994 | Low n=404 | |
| LIFE COURSE | | | | | | |
| Marital Status | | | | | | |
| Married or with partner | 49.4 | 48.5 | 0.87 | 88.7 | 81.9 | 0.05 |
| Separated, widowed, divorced or never married | 50.6 | 51.5 | | 11.3 | 18.1 | |
| INFLUENCES & RESOURCES | | | | | | |
| Race | | | | | | |
| Mexican-American | 6.8 | 10.6 | 0.10 | 16.0 | 20.6 | 0.02* |
| Non-Hispanic White | 79.8 | 72.9 | | 72.5 | 64.4 | |
| African American | 13.4 | 16.5 | | 11.5 | 15.0 | |
| Education | | | | | | |
| High school or less | 13.8 | 21.0 | 0.06 | 19.7 | 27.1 | <0.01* |
| HS diploma or GED | 22.5 | 28.6 | | 21.1 | 29.7 | |
| Some college | 63.7 | 50.4 | | 59.2 | 43.2 | |
| Income Level | | | | | | |
| <1.30 | 12.9 | 27.6 | 0.02* | 17.5 | 34.2 | <0.01* |
| 1.30-1.85 | 6.7 | 9.7 | | 10.5 | 14.5 | |
| >1.85 | 80.5 | 62.7 | | 72.0 | 51.3 | |
| PERSONAL VALUES | | | | | | |
| Diet Perception | | | | | | |
| Fair or poor | 38.3 | 23.9 | 0.03* | 34.5 | 26.1 | 0.02* |
| Excellent, very good or good | 61.7 | 76.1 | | 64.5 | 73.9 | |
| Weight control | | | | | | |
| Yes | 33.6 | 19.4 | 0.02* | 29.8 | 24.6 | 0.07 |
| No | 66.4 | 80.6 | | 70.2 | 75.4 | |
| Weight perception | | | | | | |
| Overweight | 43.7 | 35.7 | 0.11 | 51.9 | 40.9 | 0.02* |
| Underweight or about right | 56.3 | 64.2 | | 48.1 | 59.1 | |

*Chi square tests were completed to compare high versus low FAFH frequency consumers for males with and without children in the household. Significant results were those with a p-value of <0.01.

Table 5:

*Demographics and Characteristics of U.S. Adult Females Based on Presence of Children in the Household and Consumption Frequency of Food Away from Home*

| | Females | | | | | |
|---|---|---|---|---|---|---|
| | Children Absent n=885 | | p-value* | Children Present n=1603 | | p-value* |
| | High n=625 | Low n=260 | | High n=975 | Low n=628 | |
| LIFE COURSE | | | | | | |
| Marital Status | | | | | | |
| Married or with partner | 51.2 | 53.8 | 0.58 | 76.8 | 73.1 | 0.18 |
| Separated, widowed, divorced or never married | 48.8 | 46.2 | | 23.2 | 26.9 | |
| INFLUENCES & RESOURCES | | | | | | |
| Race | | | | | | |
| Mexican-American | 4.6 | 7.9 | 0.29 | 11.2 | 17.8 | 0.01* |
| Non-Hispanic White | 82.0 | 76.9 | | 73.6 | 65.8 | |
| African American | 13.4 | 15.2 | | 15.2 | 16.4 | |
| Education | | | | | | |
| High school or less | 12.6 | 21.7 | <0.02 | 19.5 | 27.2 | 0.04* |
| HS diploma or GED | 21.2 | 29.9 | | 24.8 | 27.8 | |
| Some college | 66.2 | 48.4 | | 55.7 | 45.0 | |
| Income Level | | | | | | |
| <1.30 | 15.0 | 36.3 | <0.01* | 21.4 | 37.6 | <0.01* |
| 1.30-1.85 | 8.9 | 12.1 | | 9.3 | 11.9 | |
| >1.85 | 76.1 | 51.6 | | 69.3 | 50.5 | |
| PERSONAL VALUES | | | | | | |
| Diet Perception | | | | | | |
| Fair or poor | 32.5 | 25.5 | 0.13 | 32.3 | 25.9 | 0.03* |
| Excellent, very good or good | 67.5 | 74.5 | | 67.7 | 74.1 | |
| Weight control | | | | | | |
| Yes | 49.4 | 51.1 | 0.82 | 51.1 | 49.8 | 0.77 |
| No | 50.6 | 48.9 | | 48.9 | 50.2 | |
| Weight perception | | | | | | |
| Overweight | 58.0 | 55.3 | 0.72 | 62.8 | 63.0 | 0.98 |
| Underweight or about right | 42.0 | 44.7 | | 37.2 | 37.0 | |

*Chi square tests were completed to compare high versus low FAFH frequency consumers for females with and without children in the household. Significant results were those with a p-value of <0.01.

Tables 6 and 7 show mean nutrient intakes of selected nutrients for males and females based on presence of children and FAFH frequency after adjusting for selected factors within the model. No significant differences in mean intakes were found in the male population across the four groups. For females, the percentage of calories from total fat and mean sodium intake were significantly higher for high frequency FAFH users with and without children present compared to females with low FAFH frequency without children. Females without children with low FAFH frequency also consumed a significantly lower percentage of calories from saturated fat than females with and without children with high frequency FAFH and females with children with low FAFH frequency.

Adherence to dietary recommendations did not differ across the four groups of males (Table 8). For females, some significant differences for dietary adherence were found across the four groups (Table 9). Females with children with high FAFH frequency were less likely to meet the AI for fiber compared to females with children with low FAFH frequency. Both females with and without children who have high FAFH frequency were significantly more likely to exceed the UL for sodium compared to females with children with low FAFH frequency.

## Discussion

The results of this study suggest that the presence of children in the household may have an impact on the adult's decision to eat FAFH. Analyses from this study suggest that males and females with children eat more meals prepared at home compared to males and females without children. Factors related to high FAFH consumption may differ by gender and presence of children in the household. Both male and female adults with children who have higher FAFH consumption are more likely to be Non-Hispanic white, to have higher incomes, and to have

Table 6:

*Nutrient Intakes of U.S. Adult Males Based on Presence of Children in the Household and Food Away from Home Consumption Frequency*

| | Males | | | | |
|---|---|---|---|---|---|
| | Children Absent n=1018 | | Children Present n=1398 | | |
| | High n=787 | Low n=231 | High n=994 | Low n=404 | |
| | Mean (SE) | Mean (SE) | Mean (SE) | Mean (SE) | p-value* |
| Energy | 2658.3 (49.8) | 2663.3 (84.6) | 2638.4 (39.1) | 2528.3 (70.5) | 0.55 |
| Protein (% of total calories) | 16.1 (0.2) | 16.5 (0.4) | 16.1 (0.2) | 16.3 (0.3) | 0.55 |
| Carbohydrate (% of total calories) | 47.4 (0.5) | 47.8 (0.7) | 47.8 (0.5) | 49.9 (0.7) | 0.15 |
| Fiber (g) | 17.0 (0.4) | 19.4 (0.9) | 17.1 (0.5) | 17.6 (0.7) | 0.36 |
| Total Fat (% of total calories) | 33.4 (0.4) | 32.7 (0.6) | 34.0 (0.4) | 31.9 (0.5) | 0.11 |
| Saturated Fatty Acids (% of total calories) | 11.2 (0.2) | 10.9 (0.3) | 11.3 (0.1) | 10.6 (0.2) | 0.56 |
| Cholesterol (mg) | 354.4 (8.7) | 359.5 (18.0) | 375.2 (9.1) | 355.0 (17.9) | 0.76 |
| Calcium (mg) | 1089.5 (38.0) | 1155.0 (65.7) | 1112.5 (25.4) | 1043.1 (33.7) | 0.54 |
| Iron (mg) | 18.8 (0.5) | 19.6 (0.9) | 18.5 (0.4) | 18.4 (0.7) | 0.06 |
| Sodium (mg) | 4415.1 (93.5) | 4262.9 (136.2) | 4236.4 (80.1) | 3965.9 (122.9) | 0.10 |

*$p<0.05$ indicating statistically significant finding after adjusting for marital status, race, education, income level, diet perception, weight control, and weight perception.

Table 7:

*Nutrient Intakes of U.S. Adult Females Based on Presence of Children in the Household and Food Away from Home Consumption Frequency*

| | Females | | | | |
|---|---|---|---|---|---|
| | Children Absent n=885 | | Children Present n=1603 | | |
| | High n=625 | Low n=260 | High n=975 | Low n=628 | |
| | Mean (SE) | Mean (SE) | Mean (SE) | Mean (SE) | p-value* |
| Energy | 1904.1 (26.3) | 1702.8 (59.1) | 1865.2 (34.3) | 1708.5 (24.7) | 0.80 |
| Protein (% of total calories) | 15.5 (0.2) | 16.0 (0.5) | 15.8 (0.2) | 16.3 (0.3) | 0.26 |
| Carbohydrate (% of total calories) | 49.3 (0.5) | 51.8 (0.8) | 49.8 (0.6) | 51.1 (0.7) | 0.12 |
| Fiber (g) | 14.7 (0.5) | 14.0 (0.9) | 13.5 (0.4) | 14.0 (0.5) | 0.71 |
| Total Fat (% of total calories) | 33.8 (0.4)[a] | 32.1 (0.8)[a,b] | 33.9 (0.5)[b] | 32.6 (0.5) | 0.04* |
| Saturated Fatty Acids (% of total calories) | 11.4 (0.2)[a] | 10.3 (0.4)[a,b,c] | 11.3 (0.2)[b] | 10.9 (0.2)[c] | 0.01* |
| Cholesterol (mg) | 236.1 (6.1) | 218.0 (14.4) | 245.1 (5.9) | 235.1 (7.2) | 0.25 |
| Calcium (mg) | 885.0 (26.5) | 851.2 (47.2) | 859.1 (29.3) | 806.3 (23.3) | 0.34 |
| Iron (mg) | 14.3 (0.3) | 13.4 (0.7) | 13.6 (0.3) | 13.5 (0.4) | 0.83 |
| Sodium (mg) | 3174.7[a] (55.8) | 2620.9[a,b] (88.7) | 3095.9[b] (66.3) | 2812.7 (63.5) | 0.03* |

*$p<0.05$ indicating statistically significant finding after adjusting for marital status, race, education, income level, diet perception, weight control, and weight perception.

[a, b, c] Similar subscripts represent significant differences between the groups.

Table 8:

*Percentage of U.S. Adult Males Meeting Dietary Recommendations Based on Presence of Children in the Household and Consumption Frequency of Food Away from Home*

| Nutrient | Criteria[a] | Males | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Children Absent n=1018 | | | | Children Present n=1398 | | | |
| | | High n=787 | | Low n=231 | | High n=994 | | Low n=404 | |
| | | % | OR* (95% CI) | % | OR* (95% CI) | % | OR* (95% CI) | % | |
| Protein (AMDR) | 10-35% of total calories | 97.2 | 1.5 (0.5, 4.1) | 94.5 | 0.9 (0.3, 2.5) | 97.3 | 1.6 (0.6, 4.0) | 94.9 | -- |
| Carbohydrate (AMDR) | 45-65% of total calories | 53.6 | 0.6 (0.4, 1.0) | 61.6 | 0.8 (0.4, 1.75) | 59.9 | 0.6 (0.4, 1.0) | 67.1 | -- |
| Fiber (AI) | 38g | 3.5 | 1.6 (0.8, 3.2) | 7.9 | 2.2 (0.7, 7.2) | 3.3 | 1.2 (0.5, 3.2) | 2.7 | -- |
| Total Fat (AMDR) | 20-35% of total calories | 57.8 | 0.8 (0.5, 1.3) | 61.6 | 1.0 (0.5, 2.1) | 55.8 | 0.6 (0.4, 1.0) | 61.6 | -- |
| Saturated Fatty Acids (AMDR) | <10% calories | 34.5 | 1.0 (0.6, 1.6) | 42.8 | 1.1 (0.5, 2.4) | 34.1 | 0.7 (0.5, 1.0) | 42.6 | -- |
| Cholesterol (2005 DG) | <300mg | 51.4 | 1.0 (0.7, 1.5) | 45.0 | 0.8 (0.4, 1.5) | 46.5 | 0.9 (0.6, 1.3) | 50.1 | -- |
| Calcium (AI) | 1000mg | 49.5 | 1.0 (0.7, 1.5) | 49.8 | 1.3 (0.7, 2.3) | 47.0 | 1.0 (0.7, 1.5) | 45.1 | -- |
| Iron (EAR) | 6.0mg | 98.8 | 2.1 (0.6, 7.6) | 98.3 | 2.6 (0.5, 12.3) | 98.6 | 1.6 (0.6, 4.4) | 97.7 | -- |
| Sodium (UL) | <2300mg | 9.0 | 0.9 (0.5, 1.8) | 15.8 | 1.2 (0.6, 2.4) | 9.3 | 0.9 (0.5, 2.4) | 14.2 | -- |

*OR within a 95% confidence interval indicating statistically significant finding after adjusting for marital status, race, education, income level, diet perception, weight control, and weight perception.

[a] Criteria listed are for adults 19-50 years. For adults 18 years old, some recommendations differed, and the following criteria were used in place of the criteria above: AMDR for protein of 10-30% of total calories, AMDR for total fat of 25-35% of total, AI for calcium of 1300mg, AI for fiber of 26g (females), EAR for iron of 7.9mg (females), and EAR for iron of 7.7mg (males) (Food and Nutrition Board, Institute of Medicine, 2005).

Table 9:

*Percentage of U.S. Adult Females Meeting Dietary Recommendations Based on Presence of Children in the Household and Consumption Frequency of Food Away from Home*

| Nutrient | Criteria[a] | Females | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Children Absent n=885 | | | | Children Present n=1603 | | | |
| | | High n=625 | | Low n=260 | | High n=975 | | Low n=628 | |
| | | % | OR* (95% CI) | % | OR* (95% CI) | % | OR* (95% CI) | % | |
| Protein (AMDR) | 10-35% of total calories | 95.2 | 1.0 (0.4, 2.7) | 90.0 | 0.7 (0.3, 1.6) | 94.4 | 1.0 (0.4, 2.5) | 94.2 | -- |
| Carbohydrate (AMDR) | 45-65% of total calories | 66.3 | 0.8 (0.5, 1.4) | 64.1 | 0.9 (0.5, 1.5) | 66.0 | 0.8 (0.6, 1.2) | 69.3 | -- |
| Fiber (AI) | 25g | 9.3 | 1.3 (0.7, 2.5) | 7.4 | 0.8 (0.4, 1.8) | 4.6 | 0.4 (0.2, 0.8)* | 8.5 | -- |
| Total Fat (AMDR) | 20-35% of total calories | 53.6 | 0.9 (0.5, 1.4) | 59.3 | 1.3 (0.8, 2.2) | 54.3 | 0.9 (0.7, 1.3) | 58.6 | -- |
| Saturated Fatty Acids (AMDR) | <10% calories | 36.1 | 0.9 (0.6, 1.5) | 46.4 | 1.5 (1.0, 2.3) | 36.9 | 1.0 (0.7, 1.4) | 42.8 | -- |
| Cholesterol (2005 DG) | <300mg | 76.2 | 0.7 (0.5, 1.0) | 74.3 | 0.9 (0.5, 1.5) | 71.5 | 0.8 (0.5, 1.2) | 73.9 | -- |
| Calcium (AI) | 1000mg | 34.2 | 1.6 (0.9, 2.7) | 25.8 | 1.0 (0.6, 1.9) | 31.8 | 1.4 (1.0, 2.1) | 27.1 | -- |
| Iron (EAR) | 8.1mg | 82.5 | 1.0 (0.6, 1.7) | 75.0 | 0.7 (0.3, 1.2) | 85.3 | 1.3 (0.8, 2.3) | 81.8 | -- |
| Sodium (UL) | <2300mg | 21.9 | 0.5 (0.3, 0.9)* | 44.1 | 1.3 (0.8, 2.0) | 26.6 | 0.6 (0.4, 0.9)* | 35.9 | -- |

*OR within a 95% confidence interval indicating statistically significant finding after adjusting for marital status, race, education, income level, diet perception, weight control, and weight perception.

[a] Criteria listed are for adults 19-50 years. For adults 18 years old, some recommendations differed, and the following criteria were used in place of the criteria above: AMDR for protein of 10-30% of total calories, AMDR for total fat of 25-35% of total, AI for calcium of 1300mg, AI for fiber of 26g (females), EAR for iron of 7.9mg (females), and EAR for iron of 7.7mg (males) (Food and Nutrition Board, Institute of Medicine, 2005).

more education than those with lower FAFH consumption. This finding is consistent with Blisard, Variyam, & Cromartie's (2003) findings that suggested there was a FAFH increase for each 10% increase in income and support Becker's (1965) theory that individual's with higher income may choose to buy more FAFH to decrease work time at home. In males without children, income, diet perception, and weight control efforts were factors related to frequency of FAFH consumption while in females without children only education and income were factors. Based on these findings and previous research that suggests meals prepared at home are lower in total fat, saturated fat, and sodium and higher in fiber, calcium, and iron (Lin and Frazão, 1999), one would expect the dietary intake of adults with children with low FAFH frequency to be significantly better than all other groups of adults, but this was not what the results suggested.

For males, mean nutrient intakes and adequacies of the diet did not differ by child presence in household and FAFH frequency. Although males with children consume FAFH less frequently the presence of children in the household does not seem to impact nutrient intake. Even in homes where meal preparation is shared equally by partner, males spend less time on meal preparation and food purchasing compared to women (Mancino & Newman, 2007) suggesting that men may not be the primary food decision makers in the household but rather when they are away from home. This may help explain why differences were not seen by child presence and FAFH frequency. This study did not examine sources of food which may differ, and there is no current research on the impact of children present in the household on male's dietary intake for comparison.

For the female population, child presence does appear to be related to nutrient intake, but specific results are different than what one might have predicted. Females without children who are low FAFH consumers have the lowest total fat, saturated fat, and sodium intakes compared to

all other female groups. When the two groups of females with children are examined, mean intakes did not differ significantly by FAFH frequency. However, females with children with high FAFH frequencies were less likely to meet fiber recommendations and exceed the UL for sodium compared to females with children with low frequencies. Using the Food Choice Process Model as a guide, one would expect that females with children who chose FAFH less frequently as a coping mechanism to have better mean nutrient intakes and adequacies compared to those with children with high FAFH intake. One possible reason for this discrepancy is that females with children with high and low FAFH frequency differ by race, education, and income. These differences may impact personal value systems and coping mechanisms related to food choice as predicted by the model. A higher proportion of females with children with high FAFH intake have higher incomes and more education compared to females with children with low FAFH intake. This group may be comprised of more families with dual earners so there is more income to spend on FAFH but less time to prepare food at home. Females with children with low FAFH may have more economic constraints and therefore not purchase as much FAFH, yet their dietary intakes may not be considerably better due to purchasing quick, ready-to-eat products from the grocery store.

There are several additional pieces of data that would strengthen the interpretation of results. Employment, specifically of the females, would be helpful to determine if children and FAFH consumption are a factor in female food choices. Additionally, the ages of children and quantity of children in the home was not gathered in NHANES data. Having these data would allow dietary intake, dietary adherence and FAFH consumption to be examined more closely based on ages and number of children. Meal preparation time and the types of food outlets where FAFH is purchased may add further detail to this body of research. Types of food

selected away from home and prepared at home may have similar nutrient contents. The definition of FAFH encompasses a broad group of foods, and foods that are prepared at home are not necessarily nutritionally superior to FAFH. A single, working mother may not be able to afford FAFH such as a delivered pizza, but due to time scarcity, she may choose to purchase a frozen pizza to prepare at home. The frozen pizza would not be considered FAFH yet probably has similar nutritional content to the delivery pizza. The FAFH definition may help to explain further why there were few differences in dietary intake of females with children with low and high FAFH frequencies. Additionally, research specifically assessing the impact children in the household have on males is needed.

Finally, there are several limitations within the data. First, the two 24-hour recall days may not be accurate representations of participants' usual intakes. For example, a frequent FAFH consumer may have been interviewed on days when he did not consume any FAFH. To minimize this limitation, two days of recall were used, and mean intakes were calculated. Another limitation was the selection of variables available within NHANES. There was not a specific question within NHANES data that gathered the number and ages of children in the home. Had this data been available, then relationships between family size and ages of children could be examined further. Also, all variables within the Food Choice Process Model were not selected for analysis. Variables that may impact nutrient intake were not chosen.

## Conclusion

After adjusting for selected factors from the Adapted Food Choice Model, child presence and FAFH frequency is related to nutrient intakes for females. Females without children consume FAFH more frequently than females with children. Surprisingly, the dietary intake and adequacy of females without children was similar for those with high and low FAFH intake

suggesting females with children may be using several coping mechanisms (FAFH, quick or ready-to-eat grocery products) for food decisions when time scarcity is a factor. Nutrient intakes in males did not differ by child presence in the household and FAFH frequency.

Overall dietary intake for all adults needs improvement. Saturated fat, fiber, and sodium intakes for most males do not meet the respective guidelines, and saturated fat, fiber, calcium, and sodium intakes for most females do not meet the respective guidelines. These results support previous research findings, but emphasize the need for practitioners to focus on nutrient-dense food choices and sources that can be prepared within time constraints to better meet the *Dietary Guidelines for Americans* (USDHHS & USDA, 2010) and MyPyramid (USDA, CNPP, 2005) recommendations.

## References


Becker, G. (1965). A theory of the allocation of time. *The Economics Journal*, 75, 493-517.

Blisard, W.N., Variyam, J.N., & Cromartie, J. (2003). *Food expenditures by U.S. households: Looking ahead to 2020* (AER-821). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/aer821/aer821.pdf

Boutelle, K.N., Fulkerson, J.A., Neumark-Sztainer, D., Story, M., & French, S.A. (2007). Fast food for family meals: Relationships with parent and adolescent food intake, home food availability and weight status. *Public Health Nutrition*, 10(1), 16-23. doi: 10.1017/S136898000721794X

Bowers, D.E. (2000, January). Cooking trends echo the changing roles of women. *Food Review*, 23(1), 23-25. Retrieved from: http://www.ers.usda.gov/publications/foodreview/jan2000/frjan2000d.pdf

Bowman, S. A., & Vinyard, B. T. (2004). Fast food consumption of U.S. adults: Impact on energy and nutrient intakes and overweight status. *Journal of the American College of Nutrition*, 23(2), 163-168. doi: *10.1053/S0002-8223(03)01086-1*

Bryant, W.K., & Zick, C.D. (2006). Work and Leisure: How the household spends its time, *The Economic Organization of the Household* (2nd ed.) (pp. 125-197). Cambridge: Cambridge University Press.

Burke, V., Beilin, L.J., Dunbar, D., & Kevan, M. (2004). Changes in health-related behaviours and cardiovascular risk factors in young adults: associations with living with a partner. *Preventive Medicine*, 39, 722-730. doi: 10.1016/j.ypmed.2004.02.038

Centers for Disease Control, National Center for Health Statistics (2010). NHANES 2007-08 demographic, examination, and questionnaire files [data files and code books]. Retrieved from http://www.cdc.gov/nchs/nhanes/nhanes2007-2008/quex07_08.htm

Centers for Disease Control, National Center for Health Statistics (2008). NHANES 2005-06 demographic, examination, and questionnaire files [data files and code books]. Retrieved from http://www.cdc.gov/nchs/nhanes/nhanes2005-2006/nhanes05_06.htm

Centers for Disease Control, National Center for Health Statistics. *NHANES 2007-2008 Questionnaire, Diet Behavior and Nutrition.* Retrieved from http://www.cdc.gov/nchs/data/nhanes/nhanes_07_08/DBQ_e_eng.pdf

Centers for Disease Control, National Center for Health Statistics. *NHANES 2005-2006 Questionnaire, Diet Behavior and Nutrition.* Retrieved from http://www.cdc.gov/nchs/data/nhanes/nhanes_05_06/dbq_whq_comp.pdf

Centers for Disease Control, National Center for Health Statistics. *NHANES 2007-2008 Questionnaire, Weight History.* Retrieved from http://www.cdc.gov/nchs/data/nhanes/nhanes_07_08/whq07_08_eng.pdf

Centers for Disease Control, National Center for Health Statistics. *NHANES 2005-2006 Questionnaire, Weight History.* Retrieved from http://www.cdc.gov/nchs/data/nhanes/nhanes_05_06/sp_whq_d.pdf

Clemens, L.H., Slawson, D.L., & Klesges, R.C. (1999). The effect of eating out on quality of diet in premenopausal women. *Journal of the American Dietetic Association*, 99 (4), 442-444. doi: 10.1016/S0002-8223(99)00107-8

Cutler, D.M., Glaeser, E.L., & Shapiro, J.M. (2003). Why have Americans become more obese?, *Journal of Economic Perspectives*, 17(3), 93-118. Retrieved from http://faculty.chicagobooth.edu/jesse.shapiro/research/obesity.pdf

Davis, D.E., & Stewart, H. (2002, Spring). Changing consumer demands create opportunities for U.S. food system. *Food Review*, 25(1), 19-23.Retrieved from http://www.ers.usda.gov/publications/FoodReview/May2002/frvol25i1d.pdf

Devine C.W., Connors M., & Bisogni C.A.. Life-course influences on fruit and vegetable trajectories: qualitative analysis of food choices (1998). *Journal of Nutrition Education*, 30, 361-370. doi: 10.1016/S0022-3182(98)70358-9

Devine, C.W., Farrell, T.J., Blake, C.E., Jastran, M., Wethington, E., & Bisgoni, C.A. (2009). Work conditions and the food coping strategies of employed parents. *Journal of Nutrition Education and Behavior*, 41, 365-370. doi: 10.1016/j.jneb.2009.01.007

Duffy, K.J., Gordon-Larsen, P., Jacobs, D.R., Williams, O.D., & Popkin, B.M. (2007). Differential associations of fast food and restaurant food consumption with 3-y change in body mass index: the Coronary Artery Risk Development in Young Adults Study. *American Journal of Clinical Nutrition*, 85, 201-208. Retrieved from http://www.ajcn.org/cgi/reprint/85/1/201

Felner R.D., Farber S.S., & Primavera J. (1983). Transition and stressful life events: a model for primary prevention. *Preventive psychology: theory, research, and practice*. New York: Pergamon; 42-67.

Food and Nutrition Board, Institute of Medicine. *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids*. Washington, DC: National Academies Press, 2005.

French, S.A., Harnack, L., & Jeffery, R.W. (2000). Fast food restaurant use among women in the Pound of Prevention study: Dietary, behavioral, and demographic correlates. *International Journal of Obesity*, 24, 1353-1359. Retrieved from http://www.nature.com/ijo/journal/v24/n10/pdf/0801429a.pdf

Furst, T., Connors, M., Bisgoni, C.A., Sobal, J. & Falk, L.W. (1996). Food Choice: A conceptual model of the process. *Appetite*, 26, 247-266. doi: 10.1006/appe.1996.0019

Gibson, E.L., Wardle, J., & Watts, C.J. (1998). Fruit and vegetable consumption, nutritional knowledge and beliefs in mothers and children. *Appetite*, 31(2), 205-228. doi: 10.1006/appe.1998.0180

Guenther, P.M., Juan, W.F., Lino, M., Hiza, H.A., Fungwe, T., Lucas, R. (2008) *Diet quality of low income and higher income Americans in 2003-04 as measured by the Healthy Eating Index-2005* (Nutrition Insight 42). Retrieved from U.S. Department of Agriculture website: http://www.cnpp.usda.gov/Publications/NutritionInsights/insight42.pdf

Jabs, J., Devine, C.M., Bisogni, C.A., Farrell, T.J., Jastran, M., & Wethington, E. (2006). Trying to find the quickest way: employed mothers' constructions of time for food. *Journal of Nutrition Education and Behavior*, 39, 18-25. doi: 10.1016/j.jneb.2006.08.011

Jeffery, R.W., & French, S.A. (1998). Epidemic obesity in the United States: are fast foods and television viewing contributing? *American Journal of Public Health*, 88(2), 277-280. Retrieved from http://web.ebscohost.com.libdata.lib.ua.edu/ehost/pdfviewer/pdfviewer?vid=4&hid=112&sid=dd4e9b7e-2739-47cd-a500-760caf47f377%40sessionmgr114

Kant, A.K., & Graubard, B.I. (2003). Eating out in America, 1987-2000: trends and nutritional correlates. *Preventive Medicine*, 38, 243-249. doi: 10.1016/j.ypmed.2003.10.004

Lin, B., & Frazão, E. (1999). *Away-from-home foods increasingly important to quality of American diet* (Bulletin No. 749). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/aib749/aib749.pdf

Lin, B., & Frazão, E. (1997). Nutritional quality of foods at and away from home. *FoodReview*, 33-40. Retrieved from http://www.ers.usda.gov/publications/foodreview/jan1997/jan97e.pdf

Mancino, L., & Newman, C. (2007). *Who Has Time To Cook? How Family Resources Influence Preparation* (ERR-40). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/err40/err40.pdf

Nielsen, S. J., Siega-Riz, A. M., & Popkin, B. M. (2002). Trends in food locations and sources among adolescents and young adults. *Preventive Medicine*, 35, 107-113. doi: 10.1006/pmed.2002.1037

Oliveria, S.A., Ellison, R.C., Moore, L.L., Gillman, M.W., Garrahie, E.J., & Singer, M.R. (1992). Parent-child relationships in nutrient intake: the Framingham Children's Study. *American Journal of Clinical Nutrition*, 56, 593-598. Retrieved from http://www.ajcn.org/cgi/reprint/56/3/593

Olson, B.H., Chung, K.R., Reckase, M., & Schoemer, S. (2009). Parental role on dairy intake in children, and their role in child calcium-fortified food use. *Journal of Nutrition Education and Behavior*, 41(1), 53-57. doi: 10.1016/j.jneb.2008.03.005

Paeratakul, S., Ferdinand, D.P., Champagne, C.M., Ryan, D.H., & Bray, G.A. (2003). Fast-food consumption among US adults and children: Dietary and nutrient intake profile. *Journal of the American Dietetic Association*, 103(10), 1332-1338. doi: 10.1053/S0002-8223(03) 01086-1

Pereira, M.A., Karatashov, A.I., Ebbeling, C.B., Van Horn, L., Slattery, M.L., Jacobs, D.R., & Ludwig, D.S. (2005). Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. *Lancet*, 365, 36-42. doi: 10.1016/S0140-6736(04)17663-0

Rydell, S.A., Harnack, L.J., Oakes, M., Story, J.M., Jeffrey, R.W., & French, S.A. (2008). Why eat at fast-food restaurants: Reported reasons among frequent consumers. *Journal of the American Dietetic Association*, 108, 2066-2070. doi: 10.1016/j.jada.2008.09.008

Schröder, H., Fito, M., & Covas, M.I. (2007). Association of fast food consumption with energy intake, diet quality, body mass index and risk of obesity in a representative Mediterranean population. *British Journal of Nutrition*, 98, 1274-1280. doi: 10.1017/S0007114507781436

Smith, K. J., McNaughton, S. A., Gall, S. L., Blizzard, L., Dwyer, T., & Venn, A. J., (2009). Takeaway food consumption and its associations with diet quality and abdominal obesity: a cross-sectional study of young adults. *International Journal of Behavioral Nutrition and Physical Activity*, 6(29), 1-23. doi: 10.1186/1479-5868-6-29

Sobal, J., & Bisgoni, C.A. (2009). Constructing food choice decisions. *Annals of Behavioral Medicine*, 38, S37-S46. doi: 10.1007/s12160-009-9124-5

Stewart H., Blisard, N., & Jolliffe, D.S. (2006). *Let's Eat Out: Americans Weight Taste, Convenience, and Nutrition* (EIB-19). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/eib19/eib19.pdf

U.S. Department of Agriculture, Center for Nutrition Policy and Promotion. (2005). *My Pyramid: USDA's New Food Guidance System* [powerpoint]. Retrieved from http://www.mypyramid.gov/professionals/index.html

U.S. Department of Health and Human Services and Department of Agriculture (2010). *Dietary guidelines for Americans, 2010*. Retrieved from http://www.cnpp.usda.gov/Publications/DietaryGuidelines/2010/PolicyDoc/PolicyDoc.pdf

U.S. Department of Health and Human Services and Department of Agriculture (2005). *Dietary guidelines for Americans, 2005*. Retrieved from http://www.health.gov/dietaryguidelines/dga2005/document/pdf/DGA2005.pdf

U.S. Department of Labor, Bureau of Labor Statistics. (2001). *Report on the American Workforce*. Retrieved from http://www.bls.gov/opub/rtaw/pdf/rtaw2001.pdf

U.S. Department of Labor, Bureau of Labor Statistics. (2001) *Working in the 21st Century*. Retrieved from http://www.bls.gov/opub/working/home.htm

Wells, H.F., & Busby, J.C. (2008). *Dietary Assessment of Major Trends in U.S. Food Consumption, 1970-2005* (EIB No.33). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/Publications/EIB33/EIB33.pdf

# CHAPTER 4

# OVERALL CONCLUSION

The purpose of this study was to examine differences in dietary intake of U.S. adults by (a) child presence in the household and (b) child presence plus frequency of FAFH. The dietary intake of Americans does not meet current recommendations, and identification of factors that influence nutrient intake would provide insight to improve food choices using the Food Choice Process Model. Chapter 2 of this manuscript examined nutrient intake and adequacy in adults based on child presence while Chapter 3 examined nutrient intake and adequacy in adults based on child presence and FAFH frequency. The findings in Chapter 2 suggested that child presence had little effect on adults' nutrient intakes. Therefore, most conclusions made were based on results in Chapter 3. Overall conclusions are detailed below as well as proposed next steps in this area of research.

## Both Genders' Nutrient Intake Needs Improvement

Key dietary recommendations are not being met within both genders regardless of child presence and FAFH frequency. Less than half of both males and females met the AI for fiber or calcium or were within the AMDR for saturated fat intake. In addition, over half of all males and females were above the UL for sodium. This study's findings support previous research that American adults' diets need to be improved specifically in regards to saturated fat, fiber, and sodium intakes. Adherence to dietary recommendations should continue to be encouraged, but research should also examine food choice influences.

### Presence of Children Impacts Adults' FAFH Consumption Frequency

Both genders who had children within the household ate more meals prepared at home compared to individuals without children suggesting that children make purchasing FAFH a less convenient or economical option (Chapter 3). Both males and females with children were more likely to be married or living with a partner compared to males and females without children (Chapter 2), and the males and females with children who consumed FAFH more than once per week were more likely to be Non-Hispanic white, have more education and have higher incomes (Chapter 3). These findings support previous research that FAFH purchases increase as income increases. Adults with children with high FAFH frequencies may have additional income from dual earners in the home or from higher income jobs due to education that they are able to spend on FAFH. The roles that time scarcity may play in dual earner households with children should also be considered. Adults with children who purchase FAFH more than once per week may be buying time to use on activities other than meal production. Examining the number of children within a household and the FAFH consumption rates might provide additional insight as to which parents are choosing FAFH more frequently. Additionally, further defining FAFH sources such as fast food, deli, and pizza delivery would help explain the FAFH choices being made by adults with children in the home better.

### Children in the Household Have Little Effect on Male Nutrient Intake

Dietary intake did not differ by child presence in the household and FAFH in males (Chapters 2 and 3). Significant differences were found in some nutrients but they were not clinically relevant. One possible reason for this finding may be that males have not typically been the primary food decision-makers in households. Rather, males may opt to make more food decisions when they eat outside the home. When males are the primary food decision-

makers, they spend less time in food shopping and preparation than a female in the same role, which suggests food decisions may not take on as much importance to them as women. There is no current research on the impact of children present in the household on male's dietary intake for comparison. Additional research that focused on males' food choices and sources for food would provide additional insight.

**Children Impact Females Nutrient Intake And Coping Strategies May Differ**

Females with children eat more meals prepared at home compared to females without children (Chapter 3). Meals prepared at home are usually lower in total fat, saturated fat, and sodium and higher in fiber, calcium, and iron, so one would expect females with children to have superior nutrient intake to females without children. However, findings from this study show that females without kids who had low FAFH frequency consumed the lowest total fat, saturated fat, and sodium intakes compared to all other female groups (Chapter 3). This finding could suggest two things: that foods chosen at home by women with children may not necessarily be healthier than the FAFH chosen or that females without kids are choosing healthy FAFH sources. Women with children at home may not purchase FAFH as much as women without children, but they may be purchasing more processed and ready-to-eat foods that don't differ greatly from FAFH in nutrients. Characteristics of the females with children differed by race, education, and income when examined by FAFH frequency, and the women with children with high FAFH intakes were more likely to have higher incomes and more education (Chapter 3). Again, this high FAFH frequency may be due to additional income as well as increased time scarcity and suggests that females with children may be using FAFH as a coping mechanism for increased work and family demands.

NHANES data used for this study did not gather time usage information or employment information. Future research should examine daily time usage and employment status of the primary food decision maker in the household in addition to children presence and FAFH frequency. In addition, specification of what type of FAFH that is purchased would provide some insight as to the motivation for FAFH purchases.

REFERENCES


Bastiosis, P.P., Carlson, A., Gerrior, S.A., Juan, W.Y., & Lino, M. (2002). *The Healthy Eating Index: 1999-2000* (CNPP-12). Retrieved from U.S. Department of Agriculture, Center for Nutrition Policy and Promotion website: http://www.cnpp.usda.gov/publications/hei/hei99-00report.pdf

Becker, G. (1965). A theory of the allocation of time. *The Economics Journal*, 75, 493-517.

Binkley, J.K., Eales, J., & Jekanowski, M. (2000). The relation between dietary change and rising US obesity. *International Journal of Obesity*, 24, 1032-1039. Retrieved from http://www.nature.com/ijo/journal/v24/n8/full/0801356a.html

Blisard, W.N., Variyam, J.N., & Cromartie, J. (2003). *Food expenditures by U.S. households: Looking ahead to 2020* (AER-821). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/aer821/aer821.pdf

Boutelle, K.N., Fulkerson, J.A., Neumark-Sztainer, D., Story, M., & French, S.A. (2007). Fast food for family meals: Relationships with parent and adolescent food intake, home food availability and weight status. *Public Health Nutrition*, 10(1), 16-23. doi: 10.1017/S136898000721794X

Bowers, D.E. (2000, January). Cooking trends echo the changing roles of women. *Food Review*, 23(1), 23-25. Retrieved from: http://www.ers.usda.gov/publications/foodreview/jan2000/frjan2000d.pdf

Bowman, S. A., & Vinyard, B. T. (2004). Fast food consumption of U.S. adults: Impact on energy and nutrient intakes and overweight status. *Journal of the American College of Nutrition*, 23(2), 163-168. doi: *10.1053/S0002-8223(03)01086-1*

Bryant, W.K., & Zick, C.D. (2006). Work and Leisure: How the household spends its time, *The Economic Organization of the Household* (2nd ed.) (pp. 125-197). Cambridge: Cambridge University Press.

Burke, V., Beilin, L.J., Dunbar, D., & Kevan, M. (2004). Changes in health-related behaviours and cardiovascular risk factors in young adults: associations with living with a partner. *Preventive Medicine*, 39, 722-730. doi: 10.1016/j.ypmed.2004.02.038

Casey, P.H., Goolsby, S.L.P, Lensing, S.Y., Perloff, B.P., & Bogle, M.L. (1999). The use of telephone interview methodology to obtain 24-hour dietary recalls. *Journal of the American Dietetic Association*, 99(11), 1406-1411.

Centers for Disease Control, National Center for Health Statistics (2010). NHANES 2007-08 demographic, examination, and questionnaire files [data files and code books]. Retrieved from http://www.cdc.gov/nchs/nhanes/nhanes2007-2008/quex07_08.htm

Centers for Disease Control, National Center for Health Statistics (2008). NHANES 2005-06 demographic, examination, and questionnaire files [data files and code books]. Retrieved from http://www.cdc.gov/nchs/nhanes/nhanes2005-2006/nhanes05_06.htm

Centers for Disease Control, National Center for Health Statistics (2009). *Continuous NHANES Web Tutorial.* Retrieved from http://www.cdc.gov/nchs/tutorials/Nhanes/index_current.htmew

Centers for Disease Control, National Center for Health Statistics (2007). *Births: Final Data for 2005* (National Vital Statistics Report, Vol 56, Number 6*)*. Retrieved from http://www.cdc.gov/nchs/data/nvsr/nvsr56/nvsr56_06.pdf

Centers for Disease Control, National Center for Health Statistics. *NHANES 2007-2008 Questionnaire, Diet Behavior and Nutrition.* Retrieved from http://www.cdc.gov/nchs/data/nhanes/nhanes_07_08/DBQ_e_eng.pdf

Centers for Disease Control, National Center for Health Statistics. *NHANES 2005-2006 Questionnaire, Diet Behavior and Nutrition.* Retrieved from http://www.cdc.gov/nchs/data/nhanes/nhanes_05_06/dbq_whq_comp.pdf

Centers for Disease Control, National Center for Health Statistics. *NHANES 2007-2008 Questionnaire, Weight History.* Retrieved from http://www.cdc.gov/nchs/data/nhanes/nhanes_07_08/whq07_08_eng.pdf

Centers for Disease Control, National Center for Health Statistics. *NHANES 2005-2006 Questionnaire, Weight History.* Retrieved from http://www.cdc.gov/nchs/data/nhanes/nhanes_05_06/sp_whq_d.pdf

Centers for Disease Control, National Center for Health Statistics, Press Release. (2006). *Obesity still a major problem*. Retrieved from http://www.cdc.gov/nchs/pressroom/06facts/obesity03_04.htm

Clemens, L.H., Slawson, D.L., & Klesges, R.C. (1999). The effect of eating out on quality of diet in premenopausal women. *Journal of the American Dietetic Association*, 99 (4), 442-444. doi: 10.1016/S0002-8223(99)00107-8

Clauson, A. (2000, September). Spotlight on National Food Spending. *Food Review*, 23(3), 15-17. Retrieved from http://www.ers.usda.gov/publications/foodreview/sep1997/sept97e.pdf

Cutler, D.M., Glaeser, E.L., & Shapiro, J.M. (2003). Why have Americans become more obese?, *Journal of Economic Perspectives*, 17(3), 93-118. Retrieved from http://faculty.chicagobooth.edu/jesse.shapiro/research/obesity.pdf

Davis, D.E., & Stewart, H. (2002, Spring). Changing consumer demands create opportunities for U.S. food system. *Food Review*, 25(1), 19-23.Retrieved from http://www.ers.usda.gov/publications/FoodReview/May2002/frvol25i1d.pdf

Devine C.W., Connors M., & Bisogni C.A.. Life-course influences on fruit and vegetable trajectories: qualitative analysis of food choices (1998). *Journal of Nutrition Education*, 30, 361-370. doi: 10.1016/S0022-3182(98)70358-9

Devine, C.W., Farrell, T.J., Blake, C.E., Jastran, M., Wethington, E., & Bisgoni, C.A. (2009). Work conditions and the food coping strategies of employed parents. *Journal of Nutrition Education and Behavior*, 41, 365-370. doi: 10.1016/j.jneb.2009.01.007

Diliberti, N., Bordi, P.L., Conklin, M.T., Roe, L.S., & Rolls, B.J. (2004). Increased portion size leads to increased energy intake in a restaurant meal. *Obesity Research*, 12(3), 562-568. doi: 10.1038/oby.2004.64

Duffy, K.J., Gordon-Larsen, P., Jacobs, D.R., Williams, O.D., & Popkin, B.M. (2007). Differential associations of fast food and restaurant food consumption with 3-y change in body mass index: the Coronary Artery Risk Development in Young Adults Study. *American Journal of Clinical Nutrition*, 85, 201-208. Retrieved from http://www.ajcn.org/cgi/reprint/85/1/201

Epstein, S. (1993). *Emotion and self-theory*. Handbook of emotions, M.Lewis and J.M. Haviland (eds.). New York: Guilford; 313-326.

Felner R.D., Farber S.S., & Primavera J. (1983). Transition and stressful life events: a model for primary prevention. *Preventive psychology: theory, research, and practice*. New York: Pergamon; 42-67.

Finkelstein, E.A., Trogden, J.G., Cohen, J.W., & Dietz, W. (2009). Annual medical spending attributable to obesity: payer- and service-specific estimates. *Health Affairs*, 28(5), w822-w831. doi: 10.1377/hlthaff.28.5.w822

Flegal, K.M., Carroll, M.D., Kuczmarski, R.J., & Johnson, C.L. (1997). Overweight and obesity trends in the United States: prevalence and trends, 1960-1994. *International Journal of Obesity*, 22, 39-47. Retrieved from http://www.nature.com/ijo/journal/v22/n1/pdf/0800541a.pdf

Flegel, K.M., Carroll, M.D., Ogden, C.L., & Curtin, L.R. (2010). Prevalence and trends in obesity among US adults, 1999-2008. *Journal of the American Medical Association*, 303(3), 235-241. doi: 10.1001/jama.2009.2014

Food and Nutrition Board, Institute of Medicine. *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids*. Washington, DC: National Academies Press, 2005.

Food Research and Action Center (2009). Income Guidelines and Reimbursement Rates for Federal Nutrition Programs. Retrieved from Food Research and Action Center website: http://www.frac.org/pdf/rates.PDF

French, S.A., Harnack, L., & Jeffery, R.W. (2000). Fast food restaurant use among women in the Pound of Prevention study: Dietary, behavioral, and demographic correlates. *International Journal of Obesity*, 24, 1353-1359. Retrieved from http://www.nature.com/ijo/journal/v24/n10/pdf/0801429a.pdf

Furst, T., Connors, M., Bisgoni, C.A., Sobal, J. & Falk, L.W. (1996). Food Choice: A conceptual model of the process. *Appetite*, 26, 247-266. doi: 10.1006/appe.1996.0019

Gibson, E.L., Wardle, J., & Watts, C.J. (1998). Fruit and vegetable consumption, nutritional knowledge and beliefs in mothers and children. *Appetite*, 31(2), 205-228. doi: 10.1006/appe.1998.0180

Grossman, M. (1972). On the concept of health capital and the demand for health. *The Journal of Political Economy*, 80, 223-225. doi: 10.1086/259880

Guenther, P.M., Juan, W.F., Lino, M., Hiza, H.A., Fungwe, T., Lucas, R. (2008) *Diet quality of low income and higher income Americans in 2003-04 as measured by the Healthy Eating Index-2005* (Nutrition Insight 42). Retrieved from U.S. Department of Agriculture website: http://www.cnpp.usda.gov/Publications/NutritionInsights/insight42.pdf

Guenther, P.M., Reedy, J., Krebs-Smith, S.M., Reeve, B., & Bastiosis, P.P. (2007). Development and Evaluation of the Healthy Eating Index-2005: Technical Report. Retrieved from U.S. Department of Agriculture, Center for Nutrition Policy and Promotion website: http://www.cnpp.usda.gov/healthyeatingindex.htm.

Hann, C.S., Rock, C.L., King, I., Drewnowski, A. (2001). Validation of the Healthy Eating Index with use of plasma biomarkers in a clinical sample of women. *American Journal of Clinical Nutrition*, 74, 479-486. Retrieved from http://www.ajcn.org/cgi/reprint/74/4/479

Hassan, E. (2006). Recall Bias can be a Threat to Retrospective and Prospective Research Designs. *The Internet Journal of Epidemiology, 3(2).* Retrieved from http://search.ebscohost.com.libdata.lib.ua.edu/login.aspx?direct=true&db=aph&AN=22343242&site=ehost-live

Hirschler, V., Roque, M.I., Calcagno, M.L., Gonzalez, C., Arnanda, C. (2007). Maternal waist circumference and the prediction of children's metabolic syndrome. *Archives of Pediatric and Adolescent Medicine*, 161 (12), 1205-1210. Retrieved from http://archpedi.ama-assn.org/cgi/content/abstract/161/12/1205

Huang, K. (1999). *Role of national income and prices in America's eating habits, changes, and consequences* (AIB No. 750). USDA, Economic Research Service. Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/Publications/AIB750/

Isler, L., Popper, H.T., & Ward, S. (1987). Children's purchase requests and parental responses: Results from a diary study. *Journal of Advertising Research,* 27, 28-39. doi: 10.1177/0093650203256361

Jabs, J., Devine, C.M., Bisogni, C.A., Farrell, T.J., Jastran, M., & Wethington, E. (2006). Trying to find the quickest way: employed mothers' constructions of time for food. *Journal of Nutrition Education and Behavior*, 39, 18-25. doi: 10.1016/j.jneb.2006.08.011

Jeffery, R.W., & French, S.A. (1998). Epidemic obesity in the United States: are fast foods and television viewing contributing? *American Journal of Public Health*, 88(2), 277-280. Retrieved from http://web.ebscohost.com.libdata.lib.ua.edu/ehost/pdfviewer/pdfviewer?vid=4&hid=112&sid=dd4e9b7e-2739-47cd-a500-760caf47f377%40sessionmgr114

Just, D.R., Mancino, L. & Wansink, B. (2007). *Could behavioral economics help improve diet quality for nutrition assistance programs?* (ERR-43). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/err43/err43.pdf

Kant, A.K., & Graubard, B.I. (2003). Eating out in America, 1987-2000: trends and nutritional correlates. *Preventive Medicine*, 38, 243-249. doi: 10.1016/j.ypmed.2003.10.004

Kinsey, J., and Bowland, B. (1999). How can the US food system deliver food products consistent with the Dietary Guidelines? Food marketing and retailing: an economist's view. *Food Policy*, 24, 237-253. doi: 10.1016/S0306-9192(99)00022-6

Kraak V., & Pelletier D.L. (1998). The Influence of Commercialism on the Food Purchasing Behavior of Children and Teenage Youth. *Family Economics and Nutrition Review*, 11, 15-24. Retrieved from http://proquest.umi.com.libdata.lib.ua.edu/pqdweb?index=13&did=38978832&SrchMode=3&sid=3&Fmt=6&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1277831359&clientId=31537&aid=2

Kuchler, F., Tegene, A. & Harris, M. (2005). Taxing snack foods: manipulation diet quality or financing information programs. *Review of Agricultural Economics*, 27, 4-20. doi: 10.1111/j.1467-9353.2004.00204

Laroche H.H., Hofer T.P., & Davis M.M. (2007). Adult fat intake associated with the presence of children in households: findings from NHANES III. *Journal of the American Board of Family Medicine*, 20, 9-15. doi: 10.3122/jabfm.2007.01.060085

Lin, B., & Frazão, E. (1997). Nutritional quality of foods at and away from home. *FoodReview*, 33-40. Retrieved from http://www.ers.usda.gov/publications/foodreview/jan1997/jan97e.pdf

Lin, B., & Frazão, E. (1999). *Away-from-home foods increasingly important to quality of American diet* (Bulletin No. 749). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/aib749/aib749.pdf

Mancino, L., Lin, B., & Ballenger, N. (2003). *The role of economics in eating choices and weight outcomes* (Bulletin No. 791). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/aib791/aib791.pdf

Mancino, L., & Newman, C. (2007). *Who Has Time To Cook? How Family Resources Influence Preparation* (ERR-40). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/err40/err40.pdf

McNaughton, S.A., Dunstan, D.W., Ball, K., Shaw, J., & Crawford, D. (2009). *Dietary quality is associated with diabetes and cardio-metabolic risk factors*, 139, 734-742. doi: 10.3945/jn.108.096784

Murphy, S.P., & Britten, P. (2006). Glossary of terms used in the MyPyramid food guidance system. *Journal of Nutrition Education and Behavior*, 38, S160-S161. doi: 10.1016/j.jneb.2006.08.007

National Academy of Sciences (2005). *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids*. Washington, D.C.: National Academies Press. Retrieved from http://www.nap.edu/openbook.php?isbn=0309085373

National Institutes of Health, National Heart Lung and Blood Institute Obesity Education Intitiative (2000). *The practial guide on the indentification, evaluation, and treatment of overweight and obesity in adults*. Retreived from http://www.nhlbi.nih.gov/guidelines/obesity/prctgd_c.pdf

Nielsen, S. J., Siega-Riz, A. M., & Popkin, B. M. (2002). Trends in food locations and sources among adolescents and young adults. *Preventive Medicine*, 35, 107-113. doi: 10.1006/pmed.2002.1037

Oliveria, S.A., Ellison, R.C., Moore, L.L., Gillman, M.W., Garrahie, E.J., & Singer, M.R. (1992). Parent-child relationships in nutrient intake: the Framingham Children's Study.

*American Journal of Clinical Nutrition*, 56, 593-598. Retrieved from http://www.ajcn.org/cgi/reprint/56/3/593

Olson, B.H., Chung, K.R., Reckase, M., & Schoemer, S. (2009). Parental role on dairy intake in children, and their role in child calcium-fortified food use. *Journal of Nutrition Education and Behavior*, 41(1), 53-57. doi: 10.1016/j.jneb.2008.03.005

Paeratakul, S., Ferdinand, D.P., Champagne, C.M., Ryan, D.H., & Bray, G.A. (2003). Fast-food consumption among US adults and children: Dietary and nutrient intake profile. *Journal of the American Dietetic Association*, 103(10), 1332-1338. doi: 10.1053/S0002-8223(03)01086-1

Pereira, M.A., Karatashov, A.I., Ebbeling, C.B., Van Horn, L., Slattery, M.L., Jacobs, D.R., & Ludwig, D.S. (2005). Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. *Lancet*, 365, 36-42. doi: 10.1016/S0140-6736(04)17663-0

Ricci, J.A., & Chee, E. (2005). Lost productive time associated with excess weight in the U.S. workforce. *Journal of Occupational and Environmental Medicine*, 47, 1227-1234. doi: 10.1097/01.jom.0000184871.20901.c3

Rolls, B.J., Morris, E.L., Roe, L.S. (2002). Portion size of food affects energy intake in normal-weight and overweight men and women. *American Journal of Clinical Nutrition*, 76, 1207-1213. Retrieved from http://www.ajcn.org/cgi/reprint/76/6/1207

Rose, D. (2004, July) *Who Has Time to Cook? New Directions for Food and Nutrition Policy Research on Household Meal Production*. Paper presented at the meeting of Farm Foundation and Economic Research Service, Washington, D.C. Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/emphases/healthy/timeuseconference/abstracts.htm

Rydell, S.A., Harnack, L.J., Oakes, M., Story, J.M., Jeffrey, R.W., & French, S.A. (2008). Why eat at fast-food restaurants: Reported reasons among frequent consumers. *Journal of the American Dietetic Association*, 108, 2066-2070. doi: 10.1016/j.jada.2008.09.008

Santos, J.L., Kain, J., Dominguez-Vásquez, P., Lera, L., Galván, M.,Corvalán, C., & Uauy, R. (2009). Maternal anthropometry and feeding behavior toward preschool children: Association with childhood body mass index in an observational study of Chilean families. *International Journal of Behavioral Nutrition and Physical Activity*, 6, 93-100. doi: 10.1186/1479-5868-6-93

Satia, J.A., Galanko, J.A., & Siega-Riz, A.M. (2004). Eating at fast-food restaurants is associated with dietary intake, demographic, psychosocial, and behavioural factors among African Americans in North Carolina. *Public Health Nutrition*, 7(8), 1089-1096. doi: 10.1079/PHN2004662

Schröder, H., Fito, M., & Covas, M.I. (2007). Association of fast food consumption with energy intake, diet quality, body mass index and risk of obesity in a representative Mediterranean population. *British Journal of Nutrition*, 98, 1274-1280. doi: 10.1017/S0007114507781436

Smith, K. J., McNaughton, S. A., Gall, S. L., Blizzard, L., Dwyer, T., & Venn, A. J., (2009). Takeaway food consumption and its associations with diet quality and abdominal obesity: a cross-sectional study of young adults. *International Journal of Behavioral Nutrition and Physical Activity*, 6(29), 1-23. doi: 10.1186/1479-5868-6-29

Sobal, J., & Bisgoni, C.A. (2009). Constructing food choice decisions. *Annals of Behavioral Medicine*, 38, S37-S46. doi: 10.1007/s12160-009-9124-5

Stewart, H., Blisard, N., Bhuyan, S., & Nayga, R.M. (2004). *The demand for food away from home: full-service or fast food?* (AER-829). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/aer829/

Stewart H., Blisard, N., & Jolliffe, D.S. (2006). *Let's Eat Out: Americans Weight Taste, Convenience, and Nutrition* (EIB-19). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/eib19/eib19.pdf

Todd, J.E., Mancino, L., & Lin, B-H. (2010). *The impact of food away from home on adult diet quality* (EER-90). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/publications/err90/err90.pdf

U.S. Department of Agriculture, Agricultural Research Service. (1997). *Design and operation: the Continuing Survey of Food Intakes by Individuals and the Diet and Health Knowledge Survey, 1994-96* (NFS Report No. 96-1). Retrieved from http://www.ars.usda.gov/SP2UserFiles/Place/12355000/pdf/Dor9496.pdf

U.S. Department of Agriculture, Agricultural Research Service. (2008). *Dietary Intake Data: What We Eat in America, NHANES 2005-2006*. Retrieved from http://www.ars.usda.gov/ba/bhnrc/fsrg

U.S. Department of Agriculture, Agricultural Research Service (revised 2009). *What We Eat in America (WWEIA), NHANES: Overview*. Retrieved from http://www.ars.usda.gov/Services/docs.htm?docid=13793

U.S. Department of Agriculture, Center for Nutrition Policy and Promotion. (2005). *My Pyramid: USDA's New Food Guidance System* [powerpoint]. Retrieved from http://www.mypyramid.gov/professionals/index.html

U.S. Department of Agriculture, Center for Nutrition Policy and Promotion. (2008). *Healthy Eating Index 2005 Fact Sheet* (CNPP Fact Sheet No. 1). Retrieved from http://www.cnpp.usda.gov/Publications/HEI/healthyeatingindex2005factsheet.pdf

U.S. Department of Agriculture, Economic Research Service. (2007). *Eating and Health Module (ATUS): 2006 Current Findings*. Retrieved from http://www.ers.usda.gov/Data/ATUS/Current.htm

U.S. Department of Agriculture, Economic Research Service, Briefing Rooms. (2008). *Diet Quality and Food Consumption: Dietary Trends from Food and Nutrient Availability Data*. Retrieved from http://www.ers.usda.gov/Briefing/DietQuality/Availability.htm

U.S. Department of Agriculture, Human Nutrition Information Service. (1991). Survey operations report: Nationwide Food Consumption Survey 1987/88. Retrieved from http://www.ars.usda.gov/SP2UserFiles/Place/12355000/pdf/8788/nfcs8788_survey_op_rep.pdf

U.S. Department of Health and Human Services, National Center for Health Statistics. (revised 2009). Third National Health and Nutrition Examination Survey (NHANES III) public-use data files. Retrieved from http://www.cdc.gov/nchs/products/elec_prods/subject/nhanes3.htm

U.S. Department of Health and Human Services and Department of Agriculture (2010). *Dietary guidelines for Americans, 2010*. Retrieved from http://www.cnpp.usda.gov/Publications/DietaryGuidelines/2010/PolicyDoc/PolicyDoc.pdf

U.S. Department of Health and Human Services and Department of Agriculture (2005). *Dietary guidelines for Americans 2005*. Retrieved from http://www.health.gov/dietaryguidelines/dga2005/document/pdf/DGA2005.pdf

U.S. Department of Health and Human Services and Department of Agriculture (2010). *The Surgeon General's Vision for a Healthy Fit Nation*. Retrieved from http://www.surgeongeneral.gov/library/obesityvision/obesityvision2010.pdf

U.S. Department of Labor, Bureau of Labor Statistics. (1989) Consumer Expenditure Survey, 1987. Retrieved from http://www.bls.gov/cex/1987/standard/cucomp.pdf

U.S. Department of Labor, Bureau of Labor Statistics. (2009) Consumer Expenditure Survey, 2007. Retrieved from http://www.bls.gov/cex/csxann07.pdf

U.S. Department of Labor, Bureau of Labor Statistics. (2001). *Report on the American Workforce*. Retrieved from http://www.bls.gov/opub/rtaw/pdf/rtaw2001.pdf

U.S. Department of Labor, Bureau of Labor Statistics. (2009). *Women in the Labor Force: A datebook*. Report 1018. Retreived from http://www.bls.gov/cps/wlf-databook-2009.pdf.

U.S. Department of Labor, Bureau of Labor Statistics. (2001) *Working in the 21st Century*. Retrieved from http://www.bls.gov/opub/working/home.htm

Weinstein, S.J., Vogt, T.M., Gerrior, S.A. (2004). Healthy Eating Index scores are associated with blood nutrient concentrations in the Third National Health and Nutrition Examination Survey. *Journal of the American Dietetic Association*, 104, 576-584. doi: 10.1016/j.jada.2004.01.005

Wells, H.F., & Busby, J.C. (2008). *Dietary Assessment of Major Trends in U.S. Food Consumption, 1970-2005* (EIB No.33). Retrieved from U.S. Department of Agriculture, Economic Research Service website: http://www.ers.usda.gov/Publications/EIB33/EIB33.pdf

Welsh, D., Davis, C. & Shaw, A. (1993). *USDA's Food Guide: Background and development* (Misc Publication No. 1514). Retrieved from U.S. Department of Agriculture, Human Nutrition Information Service website: http://www.cnpp.usda.gov/Publications/MyPyramid/OriginalFoodGuidePyramids/FGP/FGPBackgroundAndDevelopment.pdf

Wolongevicz, D.M., Zhu, L., Pencina, M.J., Kimokoti, R.W., Newby, P.K., D'Agostino, R.B., & Millen, B.E. (2010). *Diet quality and obesity in women: the Framingham Nutrition Studies*. 103, 1223-1229. doi: 35400018105610.0170

Young, L.R., & Nestle, M. (2002). The contribution of expanding portion sizes to the US obesity epidemic. *American Journal of Public Health*, 92(2), 246-2. Retrieved from http://proquest.umi.com.libdata.lib.ua.edu/pqdweb?index=30&did=106798632&SrchMode=3&sid=1&Fmt=6&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1277830838&clientId=31537&aid=1

# APPENDIX A

# REVIEW OF LITERATURE

While dietary intake of adults with children in the home and their use of food away from home was the primary focus of this research project, this literature review focused on a broader discussion. The review of literature explored four major areas: the American diet and how it has changed, the effect these diet changes have had on nutrient intake and health, the impact that children have on diet and food choice, and theoretical perspectives to explain food choices.

## Obesity Statistics

Based on data gathered in a national survey from 1960 to 1962, less than half of the American adult population (43.3%) was overweight (30.5%) or obese (12.8%) (Flegal, Carroll, Kuczmarski, & Johnson, 1997). When national data gathered from 2007 to 2008 were examined, approximately 68.0% of adults were overweight (34.2%) or obese (33.8%) which represents a dramatic increase over the past few decades (Flegel et al., 2010). Overweight and obesity are major health concerns because of the increase risk these weight classifications put individuals at for diseases such as hypertension, Type 2 diabetes, heart disease and stroke, certain cancers, sleep apnea and other respiratory problems, osteoarthritis, and abnormal blood lipid levels (NIH, 2000). In addition, obesity-related medical expenditures are calculated to be over $147 billion per year (Finkelstein, Trogden, Cohen, & Dietz, 2009) and obese employees cost U.S. employers an additional $11.7 billion per year due to increased absenteeism and decreased productivity while at work (Ricci & Chee, 2005). The CDC has identified multiple factors that may contribute to the rise in overweight and obesity numbers. Two of these factors identified are excess caloric intake, largely from more frequent eating out and increased intake of sugary beverages, and decreased physical activity (CDC, NCHS, 2006).

## Nutrition Guidelines and Recommendations

Numerous guidelines exist to assist Americans in making healthy eating choices and maintaining a healthy body weight. These include the *Dietary Guidelines for Americans*, MyPyramid food guidance system, mandated food labels, and web-based information and calculators issued by the USDA, the USDHHS, and other health agencies.

The *Dietary Guidelines for Americans* are updated and released every five years by the USDA to provide the American public and practitioners with research-based guidelines that promote good health and reduce chronic disease risk through diet and exercise. The current guidelines are the *2010 Dietary Guidelines for Americans*, but the previous version, *2005 Dietary Guidelines for Americans,* were in effect when data for this study was gathered and were used for comparison to the data. The 2005 guidelines focus on nine key areas: adequate nutrients within calorie needs, weight management, physical activity, food groups to encourage, fats, carbohydrates, sodium and potassium, alcoholic beverages, and food safety. Recommendations for the general public are given for each area, followed by specific recommendations for certain populations such as children, elderly, and pregnant women (USDHHS & USDA, 2010; USDHHS & USDA, 2005). The *2005 Dietary Guidelines for Americans* lay the foundation from which both consumer and research-based tools have been created such as MyPyramid and the Healthy Eating Index (USDA, CNPP, 2008).

Key recommendations in the *2005 Dietary Guidelines for Americans* to achieve high diet quality included the following:

- Consume a sufficient amount of fruits and vegetables while staying within energy needs. Two cups of fruit and 2-1/2 cups of vegetables per day are recommended for a reference 2,000-calorie intake, with higher or lower amounts depending on the calorie level.

- Choose a variety of fruits and vegetables each day. In particular, select from all five vegetable subgroups (dark green, orange, legumes, starchy vegetables, and other vegetables) several times a week.
- Consume 3 or more ounce-equivalents of whole-grain products per day, with the rest of the recommended grains coming from enriched or whole-grain products. In general, at least half the grains should come from whole grains.
- Consume 3 cups per day of fat-free or low-fat milk or equivalent milk products.
- Choose and prepare foods and beverages with little added sugars or caloric sweeteners, such as amounts suggested by the USDA Food Guide and the DASH Eating Plan.
- Consume less than 10 percent of calories from saturated fatty acids and less than 300 mg/day of cholesterol, and keep *trans* fatty acid consumption as low as possible. Keep total fat intake between 20 to 35 percent of calories, with most fats coming from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils.
- Consume less than 2,300 mg (approximately 1 tsp of salt) of sodium per day. (USDHHS & USDA, 2005)

MyPyramid is an interactive, consumer-friendly website designed to help the American public apply the *Dietary Guidelines* to their own diet by creating an eating plan specific to one's age, gender, weight goals, and physical activity level. MyPyramid also further defines the specific foods groups which are the grain, fruit, vegetable, milk, meat and beans, and oil groups, and gives information on serving sizes from each group. Other resources on the MyPyramid website include eating out tips, physical activity recommendations and calculators, dietary intake logs, and meal plans for those seeking to gain, lose, or maintain weight (USDA, CNPP, 2008).

The Healthy Eating Index is a research-based tool that was created to measure adherence to the *Dietary Guidelines* and to indicate overall diet quality. The Healthy Eating Index was updated to correlate with the revisions made in the *2005 Dietary Guidelines for Americans* and is commonly referred to as HEI-2005. HEI-2005 examines and then scores ten different areas of an individual's diet: the number of servings eaten of total fruit (including 100% juice), whole fruit, total vegetables, dark green and orange vegetables and legumes, total grains, whole grains, milk, meat and beans, oils, saturated fat, sodium, and calories from solid fat, alcohol, and added sugars.

An HEI score is calculated out of 100 possible points, with 5 or 10 points possible for each area. Scoring differs slightly for each area, but scoring for all is based upon the principal of nutrient density meaning each area is examined in terms of the nutrient or serving eaten per 1000 calories. All areas have maximum and minimum standards set. For most areas, higher intakes result in higher scores, with the exception of sodium, saturated fat and calories from solid fat, alcohol, and added sugars. In the case of these exceptions, higher intakes result in lower scores since intake negatively affects the diet quality and health (USDA, CFNPP, 2008).

Several studies have compared blood plasma concentrations of nutrients to one's calculated HEI score to validate the HEI as a tool. Hann, Rock, King, and Drewnowski (2001) analyzed 3-day diet records to calculate HEI scores for 340 women ages 21 to 80 and then compared the scores to plasma samples from the women. Higher HEI scores were associated with concentrations of blood nutrients expected of fruit and vegetable intake. These included several carotenoids ($r=0.23$ to $0.40$) with the exception of lycopene, Vitamin C ($r=0.26$), and folate ($r=0.26$) ($p<0.05$ for all). Weinstein, Vogt, and Gerrior (2004) later used NHANES III data to calculate and compare HEI scores of 16,467 adults ages 17 and older to nutrients in the

blood. Blood folate (r=0.25), Vitamin C (r=0.30), Vitamin E (r=0.27), and all of the carotenoids (r=0.17 to 0.27) except lycopene were correlated with higher HEI scores ($p<0.01$ for all). These studies suggest that HEI scores can be a valid tool to measure dietary intakes, specifically fruit and vegetable intake.

When the HEI was designed, the USDA assigned diet classifications based on overall HEI scores. A diet was classified as "good" if the HEI score was greater than 80, as "needs improvement" if the HEI score was between 51 and 80, and as "poor" if the HEI score was less than 51 (Bastiosis, Carlson, Gerrior, Juan, & Lino, 2002). When HEI-2005 was released, the USDA stated that describing one's overall HEI score with one of these classifications was "not recommended" since the score is a sum of multiple components. Classifications may hide significant changes that have occurred in one's diet in the different component areas although the overall score stays the same (Guenther, Reedy, Krebs-Smith, Reeve, & Bastiosis, 2007).

The USDA has conducted national surveys on household dietary intake for over 80 years. The most current household dietary surveys are the National Health and Nutrition Examination Surveys (NHANES) which are continuous. Prior to NHANES being conducted on a continuous basis, there were other large nutrition surveys such as the Nationwide Food Consumption Surveys conducted in 1977-78 (referred to as NFCS 1977-78) and in 1987-88 (referred to as NFCS 1987-88) and the Continuing Survey of Food Intakes by Individuals in 1989-91 (referred to as CSFII 1989-91) and in 1994-96 (referred to as CFSII 1994-94). NHANES data are frequently used by researchers to examine America's current dietary intake while NFCS and CFSII data are used to get a historical perspective of dietary intake.

## Current Dietary Intake

Wells and Busby (2008) compared adult Americans' dietary intake in 2005 to the *Dietary Guidelines for Americans, 2005* and to the MyPyramid food guidance system. Because food group recommendations differ slightly based on energy expenditure, the researchers chose to use the 2,000 calorie diet recommendations for comparison purposes. They found that Americans consume more than the recommended servings for the grain, meat and bean, and fat groups, and less than the recommended amounts of fruits, vegetables and low-fat milk and milk products.

In addition, the report showed that Americans consume excessive amounts of added fat in their daily diets. Added fat in foods may be in the form of oils or solids fats, such as butter and lard or hydrogenated fats in processed and fried foods. Consuming excessive amounts of added fat whether it is from oils or solid fats may cause one to consume more fat calories than recommended and may also contribute to higher energy intakes.

Wells and Busby (2008) also suggested that Americans eat excessive amounts of added sugar. It was estimated that the average American consumes 20 teaspoons (477 calories) of added sugars per day which appear to be primarily coming from corn sweeteners such as high-fructose corn syrup used in soft drinks and processed foods. The *Dietary Guidelines* and MyPyramid recommend that one consume foods with "little added sugar" and that calories consumed from added sugars be considered part of one's discretionary calorie allowance. However, if all discretionary calories were used for added sugars, this would amount to approximately 8 teaspoons of added sugars allowed (Wells & Busby, 2008).

Healthy Eating Index scores have also been calculated for the American diet using NHANES 2003-04 data. The HEI-2005 calculation for Americans over the age of two was 57.5

out of a possible 100 points (Guenther et al., 2008). This score could be interpreted as "needs improvement" using the USDA's previous classification guidelines (Bastiosis et al., 2002). The only areas that American adults received full possible points for were total grain servings and total meat and bean servings. Americans scored the lowest in the following areas: servings of dark green and orange vegetables, legumes, whole grains, sodium, and calories from solid fats, alcoholic beverages, and added sugars. These findings suggest that Americans are under-eating vegetables, both in servings and variety, and whole grains, as well as over-consuming less healthy foods that have added fat, sugar, and sodium in them. Interestingly, when income level was examined, higher income Americans and lower income Americans were found to have no significant differences in their HEI-2005 score (57.8 versus 56.5, respectively) (Guenther et al., 2008).

## Changes in Dietary Intake

Wells and Busby (2008) also compared dietary intakes of Americans in 2005 to those in 1970. Overall, consumption in all food groups increased from 1970 to 2005. Fruit and vegetable consumption increased by 19% since 1970 due to the increased availability of fresh, frozen and canned fruits and vegetables. Even with this increase though, the 2005 intakes of fruits and vegetable still fell short of recommended amounts and variety within the vegetable group is poor.

Consumption in both grain and meat and bean groups increased as well from appropriate consumption levels in 1970 to above recommended levels by 2005. Again, this is largely due to increased availability. The number of grain products on the market increased by 41 percent from 1970 to 2005. Yet only certain protein foods increased in availability over this time frame; poultry showed a dramatic increase, while red meat and eggs decreased. However, even with

decreased availability, red meat in 2005 was still the primary source of protein in the American diet.

Average daily milk and milk product consumption increased by 6% since 1970, but, again this intake is below the recommendations. Availability of milk products increased substantially with cheese availability tripling, yogurt availability increasing by tenfold, and milk availability increasing by 33 percent. Availability of the types of milk also changed. Between 1970 and 2005, the availability of low-fat milk increased by 143% and whole milk decreased by 73 percent.

Added fats, or fats that are added to food during processing, in the diet increased dramatically, primarily due to new products and increased availability of margarines, salad dressings, and oils. This increase in fat added to foods, in the form of both oils and solid fats, contributed to an increase in total fat intake. It is estimated that added fats alone contribute 32% of calories to the diet, and this does not take into account fat naturally in food. When naturally occurring fat is also accounted for, the average Americans daily fat intake would be well above the Acceptable Macronutrient Distribution Range (AMDR) of 20 to 35% of total calories from fat.

Finally, the increase in added sugars between 1970 and 2005 was dramatic (387%) and primarily due to increased availability of corn sweeteners such as high fructose corn syrup. This is largely due to the soft drink industry which began using corn sweeteners in 1980 (Wells & Busby, 2008).

Total energy consumed daily has also changed over the past three decades. Lin & Frazão (1999) found that the average energy intake in 1977 was 1,876 calories. By 1995, it had risen to 2,043 calories. Later research by Guenther et al. (2008) supported these findings but suggested

that by 2006, caloric intake had risen even more. They found that in 2006 people ate approximately 2,679 calories per day as compared to 2,158 calories in 1970. This increase of over 500 calories per day was then further analyzed to examine where these extra calories are coming from, and the following was found: 228 calories from added fats and oils; 181 calories from grains, primarily refined; 67 calories from added sugars and sweeteners; 29 calories from meat; 24 calories from fruits and vegetables (Guenther et al., 2008). This breakdown in calories supports the 2008 finding by Wells and Busby that compared 2005 dietary intake compared to 1970 intake.

## Causes for Changes in Americans' Dietary Intake

Current research (Bowers, 2000; Clauson, 2000; Cutler, Glaeser, & Shapiro, 2003; Davis & Stewart, 2002; Kant & Graubard, 2004; Lin & Frazão, 1999; Mancino & Newman, 2007; Nielsen, Siega-Riz, & Popkin, 2002; Rydell, Harnack, Oakes, Story, Jeffery & French, 2008; Stewart, Blisard, & Jolliffe, 2006) has suggested several possible influences for the changes that have been seen in Americans' diets over the past decades. These influences include increases in variety and availability of foods, an increase in the number of food outlets, changes to the workforce and consequently household roles, economic impacts, improvements in food technology, and an overall increase in desire for convenience when related to food.

### Changes in eating habits

Lin & Frazão (1999) used data from national food consumption surveys to compare eating habit changes made from 1977-78 to 1995. In 1977-78 American adults ate an average of 2.7 meals and 1.1 snacks per day, and 84% of those meals and 83% of those snacks were prepared at home. In 1995 American adults ate 2.6 meals and 1.6 snacks per day, and that 71% of meals and 78% of snacks were prepared at home. This suggests that Americans had increased

their snacking frequency through the day, as well as decreased the amount of meals and snacks prepared at home (Lin & Frazão, 1999).

**Changes in variety and sources of food**

Changes in intake have been impacted by the increased variety and availability of foods. To illustrate, in 1980, approximately 14,000 products were offered in supermarkets. By 1999, this had increased to over 40,000 products. (Davis & Stewart, 2002). The sources where Americans get their food have also changed, and it is important to define the types of food sources as these will be referred to throughout this manuscript and study. "Food away from home" (FAFH) is defined in USDA research and national surveys as meals and snacks prepared and purchased outside of the home. Because most research assessing dietary intake of American's uses information from these surveys, many researchers and economists have chosen to use this definition. It is important to note that this definition refers to where the food was obtained and not necessarily where it was eaten. This is the same for the term "food at home" which refers to food prepared within the home (Lin & Frazão, 1997).

Two specific types of FAFH are restaurant food and fast food. "Restaurants" refer to those with a wait staff; food is typically eaten there, but may also be picked up. "Fast food" refers to fast food restaurants, as well as pizza places and places where there is not a wait staff and food may be eaten there or taken to go (Lin & Frazão, 1997). These definitions will apply to those terms throughout the document.

Increased prevalence of eating FAFH has been documented in numerous studies. In 1995, it was estimated that Americans eat approximately 27% of meals away from home compared to 16% in 1977-78. Sources for that FAFH were predominantly restaurants and fast food establishments. In fact, the 11% increase of food eaten out was caused by a 3% increase of

meals coming from restaurants and a 6% increase of meals coming from fast food establishments (Lin & Frazão, 1997).

Analysis of national food consumption surveys from 1977-78, 1989-91, and 1994-96 support the findings above regarding increases in eating away from home and illustrate this by looking at where Americans derive their energy since the 1970's. Data from 1977-78 survey indicated that Americans received 71.4% of their total calories from meals at home and 14.3% from restaurants or fast food. Later data from 1994-1996 showed that only 52.7% of total calories came from food eaten at home and 31.5% now came from food obtained at restaurants or fast food establishments. Similar to previous findings, this research found that as the percent calories from restaurant sources increased from 1977-78 to 1994-96, total energy intakes of Americans also increased from 1899 calories to 2,274 calories (Nielsen, Siega-Riz, & Popkin, 2002).

Financial expenditure data further support the earlier findings. According to the Bureau of Labor Statistics Consumer Expenditure Survey in 2007, the average annual expenditure by an individual on food was $6,133 with 56% of this being spent on "food at home" and 44% being spent on "food away from home." Clearly, FAFH contributes to a large portion of an individual's expenditures. It is estimated that over $445 billion were spent on FAFH in 2003. When compared to the $263 billion spent on FAFH in 1992 (Stewart et al., 2003), this is an increase of about 69% in just 11 years. The two largest contributors to the $445 billion were full-service restaurants (37%) and fast food restaurants (36%).

**Work force changes**

Two changes have occurred in the work force that directly effect food choices: the increase of females in the workforce and the increase of mothers in the workforce. In fact, the

entry and steady increase of women into the workforce has been noted to be one of the biggest influences on eating habits in the United States over the past decade (Bowers, 2000). In 1950, only 33% of women worked; in 1975, 42% of women worked and 34% of mothers worked (US Department of Labor, *Report on the American Workforce,* 2001). As of 2008, over 59% of women were working and the percentage of mothers working had increased as well to 71% (US Department of Labor, 2009).

Increases in the workforce of any family member will undoubtedly force changes in other activity areas, and it appears that meal preparation has been largely impacted. In 1967, it was estimated that upstate New York married women spent between 15 to 18 hours per week on food activities, which included shopping, preparation, and clean-up. This time appears to have sharply decreased even among women who do not work. Using data gathered in 1998 and 1999, it was estimated that non-working females spent 11.5 hours and working females spent 6.3 hours on food activities (US Department of Labor, *Working in the 21st Century*, 2001).

Similar findings in 2007 by Mancino and Newman were found when they analyzed results from the 2003-04 American Time Use Survey (ATUS). They found that non-working women spent approximately 70 minutes per day on meal preparation, part-time working women spent 53-56 minutes per day, and full-time working women spent 38-46 minutes per day. Employment has had an overall impact on the time spent for meal preparation, but most notably for the women who work (Mancino & Newman, 2007).

**Household roles and marital status**

Food preparation is not just a woman's role, but more women than men claim themselves to be the "meal preparer" in the home. ATUS data for 2006 found that women who cited themselves as the main meal preparer in the home spent 55 minutes on meal preparation per day,

while men who had this role in the home spent an average of 30 minutes. In homes where the meal preparation was shared equally, women said they spent an average of 34 minutes and men an average of 25 minutes a day (Mancino & Newman, 2007). Grocery shopping time was also examined and women were found to spend an average of 9 minutes per day shopping and men an average of 6 minutes per day. Forty-eight percent of men in 1999 indicated they ate three or more meals per week away from home. Thirty-five percent of women in 1999 indicated they ate three or more meals per week away from home (Kant & Graubard, 2004).

Martial status appears to have a significant effect on meal preparation. Married women spend significantly more time per day in meal preparation across all income levels. When compared to their single counterparts, low and high income working, married women spend 19-20 and 15-16 more minutes, respectively, in meal preparation. In non-working married women, low income women spend approximately 35 minutes more and higher income women spend 28 minutes more, as compared to their single non-working counterparts. Significant time differences were not found for men when comparing marital status (Mancino & Newman, 2007).

**Economic impact on food choices**

If an individual is working outside the home, it can be assumed that the individual would have less time for household work such as meal planning and preparation. This assumption is supported by Bryant and Zick's (2006) theory on time usage in regards to the time constraint and time allocation. The time constraint equation is T=M + H + L, which defines one's total time (T) to be a sum of one's work time outside the home for pay (M), one's work time within the home (H) doing activities such as grocery shopping, meal planning, laundry, and cleaning, and one's leisure time (L). This mathematical function clearly shows how an increase in work time (M) would decrease household time (H) and/or leisure time (L). Although work time (M) increases,

the total time (T) one has cannot be increased, forcing an individual to adjust how they allocate their household and leisure times. Time is the fundamental constraint that all consumers face because no matter the workload, individuals still have the same 24 hours within a day.

Total household income is a factor that influences how one chooses to allocate their time. As household income increases, one has a greater ability to buy commodities versus to produce them. The increasing number of females and mothers in the workforce suggests that an increasing number of households are likely to seek out market substitutes for commodities that were previously produced within the home. This statement may best be understood as it relates to Becker's (1965) household production model. According to Becker, households will maximize their "consumption of goods and leisure time subject to constraints on time, budget, and ability to make consumption goods themselves." Becker is essentially saying that individuals will allocate their time based on what will give them the most reward or net benefit. In essence, working in the market may provide a greater ability to buy food made by someone else and thus decrease time spent on meal preparation at home. Since less time is spent preparing meals, one has more time to allocate towards market work or leisure activities.

Within a household, an individual will decide whether to buy or produce commodities based on what will give them the maximum amount of goods for one's work time and the degree to which goods are considered to be substitutes. Bought commodities may be used if they are considered acceptable substitutes (i.e. at least as good as home produced commodities given total cost concerns). Considering the time constraint, individuals who purchase prepared meals have more time available for other activities, so it is a simple decision of whether or not that free time is worth the cost of the meal. However, one should note that the time constraint model generally considers meals prepared away from home and home-prepared meals as perfect substitutes.

Higher income individuals do not spend less time working, but they do receive greater benefits from working in the market versus the home. The amount of commodities one can purchase becomes greater than what he could produce in a set period of time. To maximize their market work time and available leisure time, they will buy more acceptable substitutes for household produced goods. Becker's model helps explain why those with higher incomes, typically spend more on convenience foods and foods eaten away from home. A study in 2003 by Blisard, Variyam & Cromartie estimated that a 10% increase in income results in a 4 percent increase in food eaten away from home, but only a 1 percent increase in food prepared at home.

Becker's model also supports findings by Mancino and Newman (2007) that analyzed feedback from the 2003-04 ATUS. The analysis found that higher incomes had a significant and negative impact on meal preparation time. In fact, an increase of just $100 per week, or $5200 annually, suggested that nine fewer minutes were spent on home meal preparation as compared to those with lower incomes (Mancino & Newman, 2007). Based on Bryant and Zick's (2006) time constraint model and Becker's household production model (1965), less preparation time may be due to increased market work and/or to increased ability to buy prepared meals so one can enjoy greater leisure time or market work time.

Some research has also suggested that the higher one's income is the greater both the monetary and work productivity costs of being sick and away from work. Therefore, higher income individuals are more likely to invest in their health and more likely to participate in healthy habits (Grossman, 1972). Research by Mancino, Lin & Ballenger (2003) supported this concept as those with high incomes (defined as above 300% of the poverty level) ate healthier diets as assessed by the HEI than those making <300% of the poverty level. Other research has suggested differently. Binkley, Eales, & Jekanowski (2000) analyzed body weight in relation to

income level, and their findings suggested that income had a positive correlation with body weight in both men and women. Higher income people tended to weigh more than those making lower incomes.

**Health of the economy**

Whether foods are prepared at home or purchased away from home is also influenced by the overall health of the economy. During times of economic growth, more individuals are employed and are more likely to purchase meals away from home. In fact, spending on FAFH increased by 24.8 percent from 1990 to 1999, while spending on food at home increased by only 4.7 percent. Conversely, during the recession years of 1989 to 1990, food expenditures away from home decreased and at home food expenditures increased (Clauson, 2000).

**Improvements in food technology**

Food technology has advanced as Americans look for ways to make foods and meals more convenient. Advances in food technology, have provided Americans with increased availability of processed and ready-to-eat foods and improved home appliances, all of which have led to decreases in the amount of time spent on preparing meals at home (Bowers, 2000). Home meal preparation time may have decreased due to less preparation needed or been eliminated by providing increased availability, variety and economic value of prepared foods at all types of restaurants.

Regardless of how the decreased preparation time occurred, some have suggested that food technology advances have contributed to Americans being overweight and obese. Cutler, Glaeser, & Shapiro (2003) proposed a theory that mass preparation and advances in food technology have led to an increase in calories and were able to show that countries with access to processed food and mass produced food had higher rates of obesity. They proposed that the

innovations made in food preservation and partial preparation have decreased the amount of work one must do to prepare food. This decrease in work, combined with easier access to processed foods with added fat and calories, has contributed to Americans' increasing weights.

Cutler, Glaeser, & Shapiro (2003) further illustrated their theory by looking at the potato. Fifty years ago, potatoes were prepared in the home as baked, boiled, or mashed. French fries were rarely prepared due to the amount of labor involved to peel, cut, and fry. Now, potatoes can be peeled and cut by machines, seasoned, partially cooked and then frozen and packaged at a mass production site This leaves the consumer (primarily fast food restaurants) only having to throw the fries in a deep fryer for a few minutes. These changes in food processing and technology have contributed to a 30 percent increase in potato consumption in the form of French fries since 1977.

**Increased desire for food convenience**

Stewart, Blisard & Jolliffe (2006) examined the primary motivators for dining out, as well as what influenced whether an individual chooses a fast food, full-service, or home prepared meal in 700 New Jersey residents. Seventy-three percent said that they eat out at least once per week, and of that, 10% eat out every day and 25% every two to three days. When asked what types of restaurants they regularly dine at, 59% of respondents cited regularly eating food from fast food restaurants, and 63% of respondents cited regularly eating food at full service restaurants. Healthfulness, cost, convenience, and entertainment value were all determined to be variables impacting food source choices.

When seeking convenience, consumers identified that they were much more likely to eat out rather than prepare their own meals, and they were 17% more likely to eat fast food than full-service restaurant food. Those who were seeking a "dining experience" or entertainment from

their meal time were 29% more likely to choose a full-service restaurant over a fast food restaurant. Consumers who identified healthier food options as a priority were 19% more likely to choose full-service restaurants than a fast food restaurant. Finally, when asked to rank overall priorities when eating FAFH, consumers ranked taste as their top priority followed by nutrition and convenience (Stewart, Blisard, & Jolliffe, 2006).

A 2008 study examined the reasons why people chose fast food meals frequently. Rydell et al. (2008) found that 92% of the 594 study participants interviewed indicated that they ate fast food meals regularly because those meals were quick, and 80% indicated they ate fast food because fast food locations were easy to locate and drive to. In regards to meal preparation, 44% stated that they ate fast food because they were too busy to cook, and 42% said they didn't like to cook food for themselves (Rydell, Harnack, Oakes, Story, Jeffery & French, 2008).

Smith, McNaughton, Gall, Blizzard, Dwyer, & Venn (2009) examined characteristics of adults who eat meals prepared outside of the home more frequently using a sample of 2,881 Australians. The males who ate meals prepared outside of the home two or more times per week were found to be younger in age, single, smokers, and spent more time watching television or sitting. The males who ate meals prepared outside of the home two or more times per week were found to be younger in age, single, employed, and spent more time watching television or sitting (Smith et al., 2009).

## Secular Changes in Nutrient Content

Lin and Frazão (1999) compared the nutrient content of meals prepared at home to those prepared away from home to examine if meals eaten at home were healthier than meals eaten away from home. They found that meals at home provided less fat (31.5% versus 37.6%), saturated fat (10.9% versus 12.8%) cholesterol (129 mg per 1,000 calories versus 134 mg per

1,000 calories), and sodium (1,630 mg versus 1,651 mg per 1,000 calories). Meals at home provided more fiber (8.1 g per 1,000 calories versus 6.1 g per 1,000 calories), calcium (425 mg per 1,000 calories versus 343 mg per 1,000 calories) and iron (8.4 mg per 1,000 calories versus 6.3 mg per 1,000 calories) than meals away from home. In addition, every age group and gender was found to eat more fat, saturated fat, and cholesterol and less fiber and calcium when eating a meal away from home compared to eating a meal prepared at home (Lin & Frazao, 1999).

Lin & Frazão (1999) then examined how the nutritional quality of FAFH has changed by comparing the nutritional content of meals prepared outside of the home in 1995 to those in 1977-78. The comparisons indicated that meals away from home in 1995 were higher in energy content, total fat, saturated fat, cholesterol, and sodium compared to meals away from home in the past and suggest that diet quality in meals prepared outside of the home has declined over the past decades (Lin & Frazão, 1999).

Decreases in diet quality away from home may be due in part to increases in portion size. Young and Nestle (2002) compared servings of foods to their USDA and FDA defined portions, and found that most portions served in restaurants except white bread exceeded MyPyramid defined portion sizes. Pasta exceeded USDA standards by 480%, steaks by 333%, and cookies by 700%. Hamburger and French fry servings were two to five times larger than their original serving sizes in the 1950's. In addition, larger sized portions were a selling point used to promote items and more economical purchases (Young & Nestle, 2002).

Some research has indicated that having larger serving sizes actually entices one to eat more than they normally would leading to increased energy intake. Rolls, Morris and Roe (2002) tested how adults would respond to different portion sizes of macaroni and cheese. The subjects ate 30% more from the larger serving (approximately 162 calories) than they did from

the smaller serving, although they reported similar ratings of hunger and fullness. Diliberti, Bordi, Conklin, Roe, & Rolls (2004) examined the effect that larger portion size had on customers in a cafeteria. On two separate days, subjects were presented with a pasta dish. One day a standard portion was served, and another day 1.5 times the standard portion was served. The subjects ate 43% more (approximately 172 calories more) when the larger portion was served, and they also ate a larger percentage of the side items served (Diliberti et al., 2004).

**Impact of FAFH on Nutrient Intake**

Adults who consume FAFH have poorer nutrient intakes than those who dine at home more often. Clemens, Slawson, and Klesges (1999) analyzed dietary intakes of 129 pre-menopausal women. Based on food records, the women were classified as either having a low or high eating out frequency. They found that those who were in the high frequency eating out group ate significantly more fat ($p<0.001$, 79.5 versus 60.8 grams), calories ($p=0.002$, 2,057 calories versus 1,769 calories), and sodium ($p=0.43$, 3,299 mg versus 2,903 mg) and moderately more carbohydrate and protein compared to the group with the low eating out frequency.

Fast food is one type of FAFH, and the effect that fast food has on one's diet quality is more widely researched than other types of FAFH. Research by Paeratkul, Ferdinand, Champagne, Ryan, & Bray (2003) which examined dietary intakes of over 17,000 adults and children found that subjects who ate fast food consumed significantly more total fat, saturated fat, cholesterol, and sodium and ate significantly less fiber, Vitamin A, Vitamin C, and beta carotene compared to those who did not eat fast food. Bowman and Vinyard (2004) found that in both adult males and females, fast food intake was associated with higher total intakes of fat and saturated fat and with lower intakes of Vitamin A, Vitamin C, and calcium. French, Harnack

and Jeffery (2000) found that adult women who ate more frequent fast food meals consumed less fiber compared to women who ate less than three fast food meals per week.

### Impact of FAFH on Energy Consumption

In 1998, Jeffery and French examined factors contributing to obesity and found a positive association between the number of fast food meals eaten each week and total energy consumed in adult men and women (Jeffery & French, 1998). These findings have been supported by later studies that examined the impact that fast food meals have on energy intakes. Paeratkul et al. (2003) found that adults and children who consumed fast food had significantly higher energy intakes ($p<0.001$, 1,971 calories versus 1,816 calories). Bowman and Vinyard (2004) also found that adult men and women who ate fast food consumed significantly more calories than men and women who did not consume fast food ($p<0.001$ for both men and women). Men consumed 511 calories more and women consumed 226 calories more than their counterparts who did not eat fast food (Bowman & Vinyard, 2004).

### Impact of FAFH on Food Group Intake

Eating FAFH has also indicated poorer food group intake. Smith, McNaughton, Gall, Blizzard, Dwyer, & Venn (2009) found that in a sample of 2,881 Australian adults, those who ate FAFH two or more time per week were less likely to meet the Australian dietary guideline recommendations for vegetables, fruits, and dairy (Smith et al., 2009). Todd, Mancino, and Lin (2010) found similar results suggesting American adults' intake of whole grains, vegetables, and dairy is reduced when a person eats just one meal away from home per week.

When fast food was specifically examined, numerous studies suggested that it negatively affects a person's food group intake, in particular whole grains, fruits, vegetables and dairy. French, Harnack, and Jeffery (2000) assessed 891 adult women's eating habits over a three-year

period. Women who indicated that they ate fast food three or more times per week ate less fruit and vegetable servings than those women who ate fast food less than three times per week. Paeratkul, Ferdinand, Champagne, Ryan & Bray (2003) examined the diets of 17,370 adults and children and found that those who ate fast food consumed significantly less cereal, rice, grains, fruits, and vegetables, with the exception of fried potatoes. Bowman and Vinyard (2004) found that more frequent fast food intake in adults was associated with lower intakes of milk, fruit and juice, and non-starchy vegetables, yet higher intakes of non-diet soft drinks. These are similar to findings in a 15-year study examining fast food intakes that showed that those with higher fast food frequencies ate less whole grains, fruits, non-starchy vegetables, and low-fat dairy products (Pereira, Karatashov, Ebbeling, Van Horn, Slattery, Jacobs & Ludwig, 2005).

Research specifically examining fast food intake has also suggested its consumption impacts overall diet quality. Schröder, Fito, & Covas (2007) examined the effect of fast food intake on overall diet quality by calculating scores for both the HEI and the Mediterranean Diet Score (MDS) using dietary intake data 3,054 adult men and women. Those who ate fast food more than once per week had 4.3 higher odds of low "adherence" to the MDS and 3.9 higher odds of low "adherence" to the HEI ($p<0.001$ for both) than those who ate fast food once or less per week (Schröder, Fito, & Covas, 2007).

## Impact of FAFH on Health

Eating FAFH has been linked to increased body weight and obesity. Smith et al. (2009) compared body mass index to FAFH frequency, and found that women who consumed FAFH more than two times per week were more likely to be overweight or obese while men were more likely to be obese. Analysis of anthropometric data revealed that men were 33% more likely and women 22% more likely to have abdominal obesity if takeaway food was consumed more than

two times per week (Smith et al., 2009). Duffey, Gordon-Larsen, Jacobs, Williams, and Popkin (2007) followed 3,394 young adults over a three-year period as part of the Coronary Artery Risk Development in Young Adults Study (CARDIA). Subjects who increased their consumption of FAFH over the three years were associated with a 0.29 increase in body mass index ($p=0.012$) (Duffey et al., 2007). Todd, Mancino, and Lin (2010) estimated that a person gains two pounds per year for each meal eaten away from home using national food consumption survey data and suggested a possible association between rising obesity figures and increased FAFH consumption.

Similar results were also suggested when fast food was examined. Adults who consume fast food more often are heavier than those who consume fast food less frequently. Pereira et al. (2005) examined the long-term effect that fast food intake has on body weight by using data gathered from 3,031 adults ages of 18 to 30 years over 15 years from the CARDIA study. Subjects who had a "high" fast food frequency (consuming more than two fast food meals per week) throughout the study period gained an average of 9.9 pounds ($p<0.01$) over the 15-year period, compared to the individuals who had "low" fast food frequencies (consuming fast food less than once per week) throughout the study (Pereira et al., 2005). When French, Harnack, and Jeffery (2000) analyzed the dietary intake of 891 women ages 20 to 45, they found that women who ate three or more fast food meals had significantly higher body weights and BMIs than those who ate no fast food ($p<0.01$ for both, 167 pounds versus 152 pounds, 25.4 versus 28.2).

In a convenience sample of 658 African Americans adults, ages 20 to 70, Satia et al. (2004) found that BMI was significantly higher in those who identified themselves as eating fast food "usually/often" than those who eat fast food "rarely/never" (31.3 $kg/m^2$ versus 28.6 $kg/m^2$, $p=0.02$). Schröder, Fito, & Covas (2007) found in a sample of 2,940 adults that the greater the

intake of fast food (as measured in grams per day), the higher the BMI (p=0.025). They also found that eating fast food more than one time per week suggested a 129% greater chance of being obese (p=0.057). Duffey, Gordon-Larsen, Jacobs, Williams, and Popkin (2007) examined the changes in BMI in young adults in relation to fast food intake as part of the CARDIA study. The results suggested that for each fast food meal eaten per week there was a 0.13 increase in one's BMI (p=0.003).

Pereira et al. (2005) also examined insulin resistance changes in a longitudinal study using CARDIA data. Individuals who had "high" fast food frequency (consuming three or more fast food meals per week) at both the start and end of the study had a 104% greater increase in insulin resistance, as compared to the individuals who has "low" fast food frequency (consuming less than one fast food meal per week). Both black and white individuals who had "high" fast food intakes throughout the study had increased insulin resistance (Black: p=0.0061, 0.09 at year 0 versus 0.26 at year 15; White: p<0.0001, 0.32 at year 0 versus 0.37 at year 15). Changes were most significant in white individuals who were overweight at the start of the study (p=0.01).

### The Impact of Children in the Home on Adult Dietary Intake

Based on current research, it is overwhelmingly clear that the American diet has changed over the past four decades for a variety of reasons. A sector of the population that may be experiencing greater dietary decline than others is adults with children in the home. However, little research exists on how the diets of adults with children in the home differ from diets of adults without children in the home. Transitions in life such as leaving home, marriage, divorce, and becoming a parent, have been associated with changes in health behaviors (Felner et al., 1983), and changes in dietary habits have specifically been linked to changes in marital status and becoming a parent (Burke et al., 2004; Devine et al., 1998).

Some research has suggested that children have a positive influence on dietary habits. In a study of upstate New York residents, eighty-six adults were interviewed about influences and changes that occurred in their dietary habits over their lifespan and what triggered those changes. Some interviewees indicated that becoming a parent caused them to purchase and eat more fruits and vegetables in an effort to provide healthier foods for the child and to serve as a good role model. Others suggested that having a child in the home made them take meal planning more seriously, and they prepared more balanced, regular meals as a result (Devine et al., 1998).

Other studies have suggested that children in the home may have a negative effect on parental dietary intake. Burke et al. (2004) found that women, ages 18 to 25, with children increased their total energy intake by 430 calories per day during the ages of 18 to 25 years, as compared to women without children who actually decreased their calorie intake by 24 calories during that time. No significant changes were found related to fat, sodium, or fiber intake. Using NHANES data, Laroche, Hofer, and Davis (2007) found that adults with children did not have significantly higher energy intakes but did have significantly higher fat and saturated fat intakes than adults living in households without children. They also found that adults with children consumed more pizza, cheese, beef, ice cream, baked desserts, bacon, sausage, and processed meats than their counterparts.

**Children's Influence on Food Decisions**

Children's increasing role in food purchasing decisions may be one reason that children possibly have a negative impact on the dietary intake of parents. Parents control what food is purchased and consumed by younger children. However, research shows that parents may be influenced by the child regarding what to purchase, and these purchases may be less nutrient-dense than options normally purchased.

Kraak and Pelletier (1998) examined the role that commercialism has played on children's food choices. Interestingly, they suggested that children in the home are the primary decision makers regarding food choices for the family, rather than an adult. Fifty percent of parents said that grocery purchases and restaurant choices are influenced by their children, and parents were up to three times more likely to name their child as primary decision maker for where to get fast food, what restaurants to eat at, and which snack foods and cereals to buy. When parents were asked what prevented them from eating a healthier diet, they identified different food preferences among family members and their child's desire to buy and eat marketed food products, particularly snack foods and sweetened cereals.

Eighty percent of parents cited the grocery store as typically the first shopping venture that children are taken on. Food marketers are aware of this and specifically use packaging and low-level shelf placement to attract children, and hopefully, request the items from their parent. Commercials targeted towards children are most frequently for presweetened cereal, salty snacks, low-nutrient, high sugar drinks such as a fruit punch, desserts, and candy. Similarly, the most requested items by children in the grocery store are cereals and sugared snack and dessert items such as cakes, cookies and frozen treats (Kraak & Pelletier, 1998). Isler, Popper, and Ward (1987) examined the requests that children make to parents and found that 55% of children's overall requests were for foods. Among the requests for foods, 24% were for snack foods, 17% were for candy, 4% were for fast food items, and 3% were for fruits and vegetables.

**Correlations between Dietary Intake of Parent and Child**

Examining the diet quality of parents is important because research has shown that dietary intake of adults in the home is directly correlated to the dietary intake of young children living with them. During the Framingham Children's Study, dietary data were gathered from

over 106 families to assess the relationship between parents and their children, ages three to five years, dietary intake. Small, yet significant correlations were found between parents' intake and children's intake for protein, carbohydrates, fat, saturated fat, monounsaturated fatty acids, polyunsaturated fatty acids, cholesterol, sodium, and calcium. Children were 5.5 times more likely to consume diets high in saturated fat intakes when both parents consumed high levels of saturated fat than children whose parents' intakes of saturated fat were within the AMDR (95% CI: 2.6, 11.8). Children were 2.8 times more likely to consume high fat intakes when one or both parents consumed high fat diets (95% CI: 1.3-6.1), and they were 6.3 times more likely to have high dietary cholesterol intakes when both parents had high cholesterol intakes (95% CI: 2.8-14.0). Stronger correlations were seen between mother and child than father and child (Oliveria et al., 2002).

A parent's food group intake also influences a child's intake. In a sample of 92 mother-child pairs, Gibson, Wardle, and Watts (1998) found that the mother's frequency of fruit consumption and nutrition knowledge were predictive of fruit consumption by children between the ages of 9 and 11 years. The mother's belief that fruits and vegetables could prevent disease was predictive of fruit and vegetable consumption by the child. Similarly, when Olson, Chung, Reckase, and Schoemer (2009) conducted a cluster analysis of parents with children ages 10 to 13, they found that parents who had dairy products in the home, believed in the health benefits of dairy products, and ate dairy products regularly were more likely to have children who consume dairy and calcium-rich foods.

A parent's fast food frequency has also shown to have negative effects on a child's dietary intakes. Boutelle, Fulkerson, Neumark-Sztainer, Story and French (2007) compared 902 adolescents' nutrition and diet surveys with feedback from parent interviews regarding family

intake and food availability at home. Parents who served fast food for meals three or more times per week were also found to have more soda, chips, and candy in the home and less fruits and vegetables. In homes where parents reported serving less than three fast food meals per week, the odds of adolescents having vegetables served with dinner were 2.0 times higher and the odds adolescents having milk served with meals was 2.6 times higher compared to homes where parents served fast food three or more times per week ($p<0.01$ for both) (Boutelle et al., 2007).

## Understanding Food Choice Decisions

The primary method used by the USDA and other health agencies to improve health through better nutrition has been to increase nutrition knowledge. In fact, the USDA has been issuing information to practitioners and the public about how and why better food choices can promote health for over 100 years (Welsh, Davis & Shaw, 1993). The *Dietary Guidelines for Americans* was first published in 1980 to help Americans improve health and reduce chronic disease risk, and these are updated and reissued every five years. The Nutrition Labeling and Education Act was passed by Congress in 1990 which mandated that most all foods, with the exception of restaurant foods and food prepared on site, single-ingredient raw foods such as chicken, spices and extracts, and foods with no nutritive value such as plain tea or coffee, have nutrition information and standardized common definitions such as "low-fat" and "low sodium" so that the public could have nutrition facts about food products purchased. Despite the USDA's attempt to educate the American public on nutrition and the food they are eating, obesity and chronic disease rates have continued to rise. This has caused some researchers to examine food choice and consumption from perspectives other than just nutrition knowledge.

Some researchers have suggested that parents' diet quality may decline due to the concept of time scarcity. Time scarcity is the feeling that one does not have enough time to get

all tasks completed in a 24-hour period. Research has shown that time scarcity is a barrier to making healthy food choices in adults and contributes to increased fast food consumption and increased use of convenience foods (Jabs et al., 2006). Because children require additional responsibilities and time commitments for parents, the effect that time scarcity has on parental food choices should be examined.

Jabs et al. (2006) conducted in-depth interviews with 35 employed mothers to explore the effects that time scarcity had on mothers' food choices. Most mothers interviewed said they experienced time scarcity. Mothers who reported higher levels of time scarcity were single parents, had partners who did not help and/or younger children. It was felt less by mothers who had partners or older children who helped with meal preparation. Work flexibility, ability to plan, having help in meal preparation and having higher self-efficacy in cooking skills all lessened mothers' feelings of time scarcity and increased their ability to provide home-cooked meals. (Jabs et al., 2006).

Feeding their children was an overwhelming priority by all mothers, but how this was accomplished varied based on needs and values. Some mothers felt that the ability to play with their child or work an additional shift for income outweighed the value of providing a home-cooked meal. Many mothers saw cooking as a negative task that prevented them from doing other more enjoyable tasks. Consequently, convenience and ease of preparation was a higher priority than nutrition, and reliance on getting take-out meals or fast food was indicated (Jabs et al., 2006).

Time scarcity has led to its own unique set of coping mechanisms or strateiges, ways that people choose and manage food selections in response to work and family demands and stress. Devine et al. (2009) examined common food coping strategies that working parents use to

manage meal time decisions. Popular coping strategies for mothers were to have one or more fast food meal per week, one of more restaurant meals per week, eat a meal in the car while driving, skip breakfast, and to grab a snack from a vending machine at work rather than eat a lunch meal. Fathers' coping strategies were to have one or more fast food meals per week, one or more restaurant meals per week, to grab a vended snack for lunch, and to choose more canned, frozen, and prepared meals. The two most popular positive coping strategies used by parents were to cook extra so that there were leftovers for later meals and to pack a lunch for work.

## Economic Perspectives on Food Choice

Other researchers choose to examine food choice from an economic standpoint where food is considered a good. The "full price" of that good includes not only the cost to buy the food but the value of one's time spent buying, preparing, cooking and cleaning. Food, as a good, provides an individual with short and long-term effects. When consumed, food immediately provides a person with taste, an end to hunger, and flavor. Food choices can have positive or negative health effects based on energy and nutrient content. Therefore, individuals may wrestle with three economic aspects when making food choices: time, cost, and nutritional value. Because food price includes the price of one's time to prepare food, an economic viewpoint helps explain why American's consumption of food prepared outside of the home has risen (Just, Mancino, & Wansink, 2007). Some researchers have suggested improving diet may be as simple as increasing prices on less healthy foods or decreasing the prices of healthier foods such as fruits and vegetables (Kuchler, Tegene, & Harris, 2005), but research suggests conflicting findings on how increasing cost might impact diet (Huang, 1999; Kinsey & Bowland, 1999).

## Psychological and Behavioral Perspectives

When examined from a psychological and behavioral perspective, one realizes that an economic framework alone cannot fully explain food choices. Just, Mancino, & Wansink (2007) suggested that individuals rely on simple heuristics, or decision making rules based on one's past experiences, rather than deliberate problem solving techniques when faced with a decision that has long-term benefits rather than immediate. This may help explain why individuals are often more likely to choose foods that they often eat or prepare, even when they know that there may be healthier choices available.

The role that emotions play in food choice cannot be discounted either. One theory used to explain food choice is the Cognitive-Experimental Self Theory introduced by Epstein in 1993, and it helps explain why some food choices may be based on emotions rather than on cognitive processes. The Cognitive-Experimental Self Theory suggests that a person uses two thought processes to evaluate a situation before making a decision: one system that makes rapid decisions based on emotion and one system that uses logical, deliberate evaluation to make a decision. One's resources and ability to process the situation are the primary determinant of which system will win. Stress, time scarcity, lack of money and hunger may reduce one's resources and ability to make food choices that are consistent with overall good health. Any of these situations would likely make one go with the more emotional based decision and choose less healthy foods or one's "normal" choices. Conversely, ability to plan, cooking skills, and time would likely make a person go with the logical decision-making process and choose foods based on nutrition knowledge (Epstein, 1993).

## The Food Choice Process Model

Another theory, the Food Choice Process Model, was introduced in 1996 by Furst et al. and incorporates economic, psychological, and behavioral viewpoints to more fully explain food choice. This model views food choice as a complex process that takes into account personal experience, cost, taste, convenience and environment, as well as what one values and is willing to negotiate. There are three main components in the Food Choice Process Model (Figure 1) that interact and work together to help one make a food choice: life course, influences, and personal systems.

The first component is life course, and it refers to past experiences and events that may influence current food choices. This includes one's culture and food upbringing, one's usual diet pattern or "food identity", as well as significant life events that influence food intake and the environment and timing of these events. Examples of a significant event may be marriage or divorce or having a health scare that triggers one to adopt a very prudent diet.

The second component is influences, and influences have been broken down into five categories: ideals, personal factors, resources, social framework, and food context. Ideals are accepted rules that one has about food and often are the result of one's upbringing and culture; one uses these ideals to judge food as good, bad, acceptable, unacceptable or healthier than another. A common cultural ideal Americans have is that one needs three meals per day, even though frequent small meals throughout the day may better fit a person's schedule and hunger. Personal factors are physiological factors (such as genetic problems or diseases that may influence diet), psychological factors (such as taste preferences), and social factors (such as the roles one plays – wife, mother, manager). Our social roles may further influence food behaviors especially when one is given labels such as a "picky eater", "healthy eater" or "good cook".

Resources are what a person needs to choose and eat food, and they include income, time, food availability, cooking skills, and equipment. Social frameworks are the situations one is in that either facilitate or inhibit food decisions. An example of a social factor than may inhibit food choices is a factory worker who is limited to only a vending machine during his lunch break. Finally, food contexts refer to the larger environment and may include politics, economic health, marketing campaigns, as well as one's physical environment and location in the country.

The final component in the Food Choice Process Model is personal systems about food. Food choices are guided by one's food systems which help a person make decisions. A personal food system is the development of food values, the negotiation of these values, and the creation of scripts one will use for recurring food decisions. Values may include convenience, nutrition, quality, money, and relationships and expectations. Individuals will negotiate what values they are willing to sacrifice in place of other values (Furst et al., 1996; Sobal & Bisgoni, 2009). For example, a single mother may value good nutrition and preparing meals for her family, but in order to spend time with her children, she is willing to give up some nutrition and cooking for more convenient, quicker meal options.

To simplify food choice, a person will classify foods and then use scripts to make a food choice based on how that food is classified in their mind. When a person tries a new food, recipe, or eating plan, and has a positive experience, one's script may be slightly rewritten to accommodate this new food or behavior. This gives one's food choice structure and routine and simplifies decision-making (Sobal & Bisgoni, 2009).

The Food Choice Process Model is the most exhaustive perspective on food choice discussed and perhaps the most thorough in addressing all aspects, including economic, psychological, behavioral, and cognitive, related to food decisions. Because of its inclusiveness,

this researcher chose to use the Food Choice Process Model as the basis for this study. This framework was useful when examining the decrease in American diet quality due to the multitude of contributors to decreased diet quality that stem from different viewpoints and settings. The model also suggested that interventions to influence food choice must be very specific to the target group's perceptions, ideals, lifestyles, economics, and environment.

The food choices of the American population should be examined due to the overall decline in diet quality and increase in chronic diseases. The factors that influence the food choices of parents and the impact that these food choices have on diet and health is of particular interest to dietitians and health providers in research and practice. This study attempted to examine whether adults with children in the household have significantly different nutrient intakes in comparison to adults without children in the household and if they are more or less likely to meet nutrition guidelines in comparison to adults without children in the household. Due to the limitations of secondary data analysis, variable selection was completed based on a modified version of the Food Choice Process Model. This researcher anticipated that presence of children in the household would decrease diet quality of adults in the household due to coping strategies, such as meals eaten away from home, related to time scarcity.

# APPENDIX B

# METHOLOGY

This chapter describes in detail the methodology used in this study, including the methods used to determine and assess nutrient intake, nutrient adequacy, and frequency of eating foods prepared away from home. This study used secondary data for adults from the National Health and Nutrition Examination Survey 2005-2006 (NHANES 2005-2006) and the National Health and Nutrition Examination Survey 2007-2008 (NHANES 2007-2008). Adults for the purposes of this study were defined as those 18 to 50 years in age; children will be defined as those 17 years or younger.

## Research Questions

The research questions were divided into two major themes: (a) nutrient intake and likelihood of meeting national intake guidelines and (b) the effect that frequency of FAFH has on nutrient intake and likelihood of meeting recommended intake guidelines. The research questions examined differences in these measures between adults with and without children in the home.

To assess nutrient intake and likelihood of meeting recommended intake guidelines, the research questions were:

1. Are there significant differences in nutrient intakes between adults with and without children living in the household? Nutrients examined included: total fat, saturated fat, protein, carbohydrate, cholesterol, fiber, sodium, calcium, and iron.
2. Are adults with children in the household more likely to meet national dietary recommendations than adults without children in the household? Nutrients recommendations examined included: Compliance to National Academy of Sciences' (NAS) Acceptable Macronutrient Distribution Ranges (AMDR) for total fat, saturated fat, protein, and carbohydrate, the *2010* and *2005 Dietary Guidelines* recommendation for cholesterol, the

Adequate Intake levels (AI) for fiber and calcium, the Tolerable Upper Intake Level (UL) for sodium, and the Estimated Average Requirement (EAR) for iron.

To assess frequency of FAFH and effect on nutrient intake and likelihood of meeting recommended intake guidelines, the research questions were:

3. Does having children in the home modify the relationship between frequency of foods eaten outside the home and nutrient intake? This question will examine differences in nutrient intakes across four groups of adults classified based on whether they have children and eat FAFH frequently. Nutrients examined included: total fat, saturated fat, protein, carbohydrate, cholesterol, fiber, sodium, calcium, and iron.

4. Does having children in the home modify the relationship between frequency of foods eaten outside the home and compliance to national dietary recommendations? Nutrient recommendations examined included: Compliance to AMDR for total fat, saturated fat, protein, and carbohydrate, the USDA's *2010* and *2005 Dietary Guidelines for Americans* recommendation for cholesterol, AI for fiber and calcium, UL for sodium, and EAR for iron.

## Data Collection and Study Sample

Data collected as part of NHANES 2005-2006 and NHANES 2007-2008 were through a partnership between the USDHHS and the CDC. NHANES sampling was designed to be representative of the civilian, non-institutionalized United States population. Sampling for NHANES was multi-staged, with oversampling of subgroups based on gender, age, income, and race/ethnicity to ensure representative sample of non-institutionalized U.S citizens. For NHANES 2005-2008, the oversampled populations were African-Americans, Mexican-Americans, people with low incomes, adolescents aged 12 to 19 years, and adults aged 60 years and above.

The first step in sample selection included the completion of a household screening questionnaire which was administered by a trained interviewer fluent in both English and Spanish. During the initial screening, demographic data were gathered, followed by consent documents for additional testing and questionnaires. If a participant is selected for inclusion in NHANES, then they underwent a physical examination and complete additional questionnaires on varied health-related topics including diet, health status and conditions, household environment and income, and physical activity (CDC, NCHS, 2009).

Dietary data was gathered from participants at several stages. During the examination, participants were asked to complete the Diet Behavior and Nutrition Questionnaire which asks about dietary-related habits such as use of food assistance programs like WIC and school lunch programs, eating preferences such as vegetarianism, and consumption frequency of meals prepared away from home.

NHANES also gathered two non-consecutive days of dietary intake from each participant through 24-hour recalls. These two recall days are sometimes referred to as the "What We Eat in America" portion of NHANES. The first 24-hour recall was gathered by a trained dietary interviewer during the examination. The NHANES dietary interviewers undergo extensive training on proper interview and probing techniques to help increase accuracy of recall from the participant and interpretation and recording of data by the interviewer. All interviewers were bilingual in English and Spanish. For each food or beverage identified as consumed by the participant, the interviewer recorded the amount, where the food was obtained, where the food was eaten, and the meal or occasion it was eaten. Participants then completed a second 24-hour recall, referred to as Day Two, by phone one to two weeks later with a trained interviewer (CDC,

NCHS, *NHANES 2005-2006 Questionnaire, Diet Behavior and Nutrition;* CDC, NCHS, *NHANES 2007-2008 Questionnaire, Diet Behavior and Nutrition*).

A sample of adults (n=4904) between the ages of 18 and 50 years who completed two 24-recalls was selected from the 2005-2006 NHANES and 2007-2008 NHANES. The sample will be divided by gender (2416 males and 2488 females) and the presence of children in the home (3001 with children and 1903 without children) (CDC, NCHS, 2008). "Adult" and "child" classifications were based upon the National Academy of Sciences intake recommendations for nutrients. Male and female nutrient intakes for "adults" were for individuals between 19 and 50 years of age. NHANES survey participants identified whether they had children in the home based on responses to questions for only those who had individuals aged 17 years and below. Therefore, "adults" were defined as those 18 to 50 years in age; children were defined as those 17 years or younger. An IRB exemption was received from the University of Alabama Institutional Review Board to conduct this study since it used de-identified NHANES 2005-06 and NHANES 2007-2008 data.

## Measures of Interest

To examine factors impacting food choice decisions, a modified version of the Food Choice Process Model was used to determine which measures of interest to include in the analyses. A modified version of the model was used since not all the model variables are represented in NHANES data.

### Food Decisions

The food decisions made determined what a person consumed and thus their nutrient intakes. Therefore, nutrient intakes were the dependent variables. The dependent variables examined were the same for Research Questions 1 and 3 and the same for Research Questions 2

and 4. For Questions 1 and 3, the nutrient values were compared between groups, and the dependent variables were the two-day average intake of total fat, saturated fat, cholesterol, protein, carbohydrate, fiber, sodium, calcium, and iron. The average for each of these nutrients was calculated for each individual using the intake amounts analyzed for recall Days 1 and 2. These nutrients were chosen since they are specifically addressed in the *2005 Dietary Guidelines for Americans* which were the guidelines at the time data was gathered.

For Questions 2 and 4, the individual's average intake of each nutrient was compared to recommendations set by the NAS for all nutrients with the exception of cholesterol which was compared to the USDA's *2010* and *2005 Dietary Guidelines for Americans* recommendation. To do this, the researcher recoded each nutrient as a dichotomous, categorical variable based on whether the individual was meeting or not meeting the recommendations. Once recoded, groups were compared to determine if certain groups are more or less likely to meet each nutrient standard. Nutrient recommendations used included: AMDR ranges for total fat, saturated fat, protein, and carbohydrate, USDA recommendation for cholesterol, AI for fiber, UL for sodium, AI for calcium, and EAR for iron.

**AMDR ranges.** The AMDR ranges were based on the percentage of energy coming from fats, protein, and carbohydrates in comparison to the total calories consumed. The NAS has recommended AMDR ranges for total fat, saturated fat, protein, and carbohydrates. The percent of calories coming from each of these nutrients was calculated in SAS using the calories from the average grams consumed divided by the average energy intake. Once calculated, the percentages wererecoded as either meeting, meaning falling within the AMDR, or not meeting, meaning falling above or below the AMDR for each of the nutrients. AMDR ranges are the following for those aged 19 to 50 years: 20 to 35% of calories from fat, <10% of calories from

saturated fat, 10 to 35% of calories from protein, and 45 to 65% of calories from carbohydrates. AMDR ranges for adults 18 years are the same except for protein which is 10 to 30% and for fat which is 25 to 35% (National Academy of Sciences, 2005).

**USDA Recommendations**. There is no DRI for cholesterol since cholesterol is not considered a nutrient and can have negative health effects when consumed in excess. Therefore, this study will use the USDA's *2010* and *2005 Dietary Guidelines for American*s recommendation for cholesterol which is to consume less than 300 mg of cholesterol per day for all ages and genders (USDHHS & USDA, 2010; USDHHS & USDA, 2005). Calculated average intakes at or above 300 mg were recoded as not meeting the recommendation; those below 300 mg were recoded as meeting the recommendation.

**Dietary Reference Intakes: AI, EAR, and UL.** For the remaining nutrients, the NAS based recommendations on the Dietary Reference Intakes (DRI), which were Adequate Intakes (AI), Estimated Average Requirements (EAR), and Tolerable Upper Intake Level (UL). Fiber intake was examined by comparing the average total fiber intake to the AI defined for gender and adult age groups by the DRI. For adult males ages 18 to 50 years and females ages 19 to50 years, the AIs for fiber were 38 and 25 grams, respectively. The AI for 18 year old females was 26 grams. Average fiber intakes at or above these amounts were recoded as meeting the fiber recommendation; average fiber intakes below these amounts were recoded as not meeting the fiber recommendation.

Average sodium intake were compared to the UL of the DRI or 2,300 mg. Individuals below 2300mg were recoded as meeting the recommendation for sodium. Individuals at or above 2300mg were recoded as not meeting the recommendation.

Average calcium intake were compared to the AI defined for gender and adult age groups by the DRI. AI for both males and females 18 years of age was 1,300 milligrams per day. Adequate Intake for both males and females aged 19 to 50 years was 1,000 milligrams. Average calcium intakes at or above these amounts were recoded as meeting the calcium recommendation; average calcium intakes below these amounts were recoded as not meeting the calcium recommendation.

For iron, there was enough scientific evidence to support the establishment of a recommended dietary allowance (RDA). When a nutrient has an established RDA, the EAR can be used as a cut-point to determine the risk of inadequacy of intake. The EAR for males was 7.7mg for those age 18 years and 6.0mg for those age 19 to 50 years. The EAR for females was 7.9mg for those age 18 years and 8.1mg for those age 19 to 50 years (National Academy of Sciences, 2005). Nutrients chosen were those that are specifically addressed in the *Dietary Guidelines for Americans*.

**Life Course Descriptors**

**Independent Variable of Interest.** Presence of children in the home was a life course descriptor and was the primary independent variable of interest in this study. NHANES does not specifically ask if children live in the home or how many children live in the home. However, a single question within the Food Security Questionnaire asked participants to respond to the question only if they had children in the home aged 17 or under. This question allowed the researcher to recode responses to this question as a dichotomous variable indicating the individual either had children in the household or did not have children in the household. Therefore, children were defined as people aged 17 years and under.

**Control Variable.** Marital status was the other variable that can be categorized as a life course descriptor, and it was used as a control. Marital status responses were recoded into two categories: "married or with partner" and "single". "Single" included those who state their status as separated, divorced, widowed, or never married.

**Influences**

Several variables represented measures of influence in the adapted model. These variables were gender, race, education level, income, and perception of diet quality. All of the variables representing influences served as confounding variables.

**Gender.** Gender responses were recoded into two categories: "male" and "female".

**Race.** The three largest racial groups were examined in this study: Mexican American, Non-Hispanic White, and Non-Hispanic African-American. "Other Hispanics" and "Other" category had limited respondents and therefore were recoded as missing values and were not used in this analysis. Although race could also be considered a life course variable, it was used as a measure of influence as a proxy for culture.

**Education level.** Education level responses were recoded into three categories: "some high school or less", "high school diploma or GED", and "college degree." "Some high school or less" included those who did not graduate from high school or dropped out of school during or prior to high school. "High school diploma or GED" included those who received a high school diploma or GED. These individuals may have attended some college but did not graduate from college. "College degree" included those who have graduate from a 2-year or 4-year college as well as those with advanced degrees such as Masters or Doctorates. "Refused" and "don't know" responses were recoded as missing.

**Income.** Income served as the construct to measure one's resources. Income level was based upon the poverty-income ratio which is a measure of a family's income relative to poverty thresholds provided in NHANES data that ranges from 0 to 5.0. Based on this ratio, the survey respondents were recoded into one of three income categories: 1.30 or less (indicating household income was 130% of federal poverty level or less), 1.31-1.85 (indicating household income was 131-185% of federal poverty level), and above 1.85 (indicating household income was above 185% of federal poverty level). These categories were based upon federal food assistance guidelines. One's household income must be at or below 130% of the federal poverty level to qualify for food stamps and for free school breakfast and lunch; similarly, one's household income must be between 131 to 185% of the federal poverty level to qualify for WIC and reduced-cost school breakfast and lunch (Food Research and Action Center, 2009). Household incomes above 185% do not qualify for any federal food assistance.

**Perception of diet quality.** Perception of diet quality was used as a way to assess one's ideals. One's perception of diet quality was based on feedback from the following question: "In general, how healthy is {your/his/her} overall diet?" (CDC, NCHS, *NHANES 2007-2008 Questionnaire, Diet Behavior and Nutrition;* CDC, NCHS, *NHANES 2005-2006 Questionnaire, Diet Behavior and Nutrition*). Possible responses included excellent, very good, good, fair, poor, and refused. Answers were recoded into two possible categories: "good" and "needs improvement". "Excellent" and "very good" were recoded as "good". "Poor" was recoded as "needs improvement". "Refused" responses were recoded as missing.

**Personal Systems**

Weight control and perceived weight status served as measures of interest to represent personal systems to indicate one's value of health and nutrition.

**Weight control.** Data for the weight control variable was based on feedback from the following question: "During the past 12 months, have {you/she/he} tried to lose weight?" (CDC, NCHS, *NHANES 2007-2008 Questionnaire, Weight History;* CDC, NCHS, *NHANES 2007-2008 Questionnaire, Weight History*; CDC, NCHS, *NHANES 2005-2006 Questionnaire, Weight History;* CDC, NCHS, *NHANES 2005-2006 Questionnaire, Weight History).* Possible responses included yes, no, refused, and don't know. Only "yes" and "no" answers were used. "Refused" and "don't know" responses were be recoded as missing.

**Perceived weight status.** Data for the perceived weight status was based on feedback from the following question: "{Do you/Does SP} consider {your/his/her}self now to be….overweight, underweight, or about the right weight?" (CDC, NCHS, *NHANES 2007-2008 Questionnaire, Weight History;* CDC, NCHS, *NHANES 2007-2008 Questionnaire, Weight History*; CDC, NCHS, *NHANES 2005-2006 Questionnaire, Weight History;* CDC, NCHS, *NHANES 2005-2006 Questionnaire, Weight History).* Possible responses included overweight, underweight, or about the right weight, refused, and don't know. Only "overweight", "underweight", or "about the right weight" answers were used. "Refused" and "don't know" responses were recoded as missing.

**Coping Strategies**

In Research Questions 3 and 4, an additional independent variable of interest was introduced, frequency of meals consumed that were prepared away from home. The frequency level, low or high, was determined based on answers to the following question:

> On average, how many meals per week (do you/does SP) get that were not prepared at home? Please include meals from both dine-in and carry out restaurants, restaurants that deliver food to your home, cafeterias, fast-food

places, food courts, meals prepared at a grocery store, and meals from vending machines. (CDC, NCHS, *NHANES 2007-2008 Questionnaire, Diet Behavior and Nutrition*; CDC, NCHS, *NHANES 2005-2006 Questionnaire, Diet Behavior and Nutrition*)

Responses to this question allowed for an open-ended numerical answer, as well as the following answers: never, less than weekly, refused, and don't know. Numerical responses from this question were recoded as a dichotomous, categorical variable indicating low or high frequency. "Low frequency" was defined as 1 or fewer meals consumed weekly that were prepared away from home per week, and "high frequency" was defined as 2 or more meals consumed weekly that were prepared away from home per week. These definitions of low and high frequency were consistent FAFH frequency definitions used in current research (Schröder, Fito, & Covas, 2007; Smith et al., 2009). "Never" or "less than weekly" responses were recoded as low. "Refused" and "don't know" responses were recoded as missing.

**Data Management and Analysis**

NHANES 2005-2006 and NHANES 2007-2008 was downloaded from the Centers of Disease Control's website. Due to the multiple components of NHANES, each survey participant was assigned a unique, anonymous identifying number which allowed for different components of NHANES to be sorted by identifying participant number and merged together for analysis. Data management and recoding was carried out using SAS (version 9.1, SAS Institute Inc, Cary, NC). All other statistical analyses were carried out using SUDAAN (version 10.0.1, 2010, Research Triangle Institute, Research Triangle Park, NC) which controlled for NHANES 2005-2006 and NHANES 2007-2008 sampling weights and the complexity of the survey design.

Data analysis first focused on indentifying the sample and variables from the NHANES data set and then recoding the independent, dependent and control variables. Once variables was recoded, descriptive statistics were run to examine data normality, to eliminate missing data, and to compare variable distribution with the NHANES codebooks to ensure no errors had been made in the recoding and refining process. The CROSSTAB and DESCRIPT procedures in SUDAAN were used to compute means, standard errors, distribution ranges, frequencies, and cross tabulation statistics.

Multivariate tests were then be run using SUDAAN. Multivariate tests using SUDAAN were used to examine the relationship of the dependent variables in questions 1 and 2 with the independent measure of presence of children in the household or not, while controlling for gender, race, marital status, education level, income, and perception of diet quality. They were then again used to examine the relationship of the dependent variables in questions 3 and 4 with the independent measure of presence of children in the household and frequency of FAFH, while controlling for the same confounding factors. Tests with an $\alpha \leq 0.01$ were considered significant.

Question 1: Are there significant differences in nutrient intakes between adults with and without children living in the household? Nutrients examined included: total fat, saturated fat, protein, carbohydrate, cholesterol, fiber, sodium, calcium, and iron.

To answer Question 1, each of the two-day nutrient averages was considered a dependent variable in separate linear regression models where presence of children in the household was the independent variable of interest, while controlling for gender, race, marital status, education level, income, and perception of diet quality using the REGRESS procedure in SUDAAN.

Question 2: Are adults with children in the household more likely to meet dietary recommendations than adults without children in the household? Nutrients examined included:

Compliance to AMDR for total fat, saturated fat, protein, and carbohydrate, the USDA's *2005 Dietary Guidelines for Americans* recommendation for cholesterol, AI for fiber, UL for sodium, AI for calcium, and EAR for iron.

To answer Question 2, each of the nutrients, recoded as either meeting or not meeting the NAS' recommendations, was considered a dependent variable in separate logistic regression models where presence of children in the household was the independent variable of interest, while controlling for gender, race, marital status, education level, income, and perception of diet quality using the LOGISTIC procedure in SUDAAN. Odd ratios and confidence intervals were generated from each model and were used to describe the relationship between presence or absence of children and meeting of nutrient recommendations.

Question 3: Does having children in the home modify the relationship between frequency of foods eaten outside the home and nutrient intake commendations? This question examined differences in nutrient intakes across four groups of adults classified based on whether they have children and eat FAFH frequently? Nutrients examined included: total fat, saturated fat, protein, carbohydrate, cholesterol, fiber, sodium, calcium, and iron.

The four groups examined were: Group 1 (adults with children in the home and low frequency of FAFH), Group 2 (adults with children in the home and high frequency of FAFH), Group 3 (adults with no children in the home and low frequency of FAFH), and Group 4 (adults with no children in the home and high frequency of FAFH)? FAFH frequency was defined "low," indicating 1 or fewer meals consumed weekly are prepared outside the home, and "high," indicating 2 or more meals consumed weekly are prepared outside the home.

To answer Question 3, each of the nutrient averages was considered a dependent variable in separate linear regression models across the four groups, while controlling for gender, race,

marital status, education level, income, and perception of diet quality using the REGRESS procedure in SUDAAN.

Question 4: Does having children in the home modify the relationship between frequency of foods eaten outside the home and compliance to national dietary recommendations? Nutrients recommendations examined included: Compliance to AMDR for total fat, saturated fat, protein, and carbohydrate, the USDA's *2010* and *2005 Dietary Guidelines for Americans* recommendation for cholesterol, AI for fiber and calcium, UL for sodium, and EAR for iron. The same groups and frequency definitions for FAFH used in Question 3 will be used in this question.

To answer Question 4, each of the nutrients, recoded as either meeting or not meeting the NAS' recommendations, was considered a dependent variable in separate logistic regression models across the four groups defined in Question 3, while controlling for gender, race, marital status, education level, income, and perception of diet quality using the LOGISTIC procedure in SUDAAN. Odd ratios and confidence intervals were generated from each model and were used to describe the relationship among the four groups and meeting of nutrient recommendations.

## Limitations and Assumptions

One limitation of this study was that dietary information was based upon self-reporting from memory of the individual being interviewed from the previous 24 hours, including specific food and beverage eaten, amount consumed, preparation of food, and source of food, and recorded by the dietary interviewer. Self-reported data are at risk for a type of information bias called recall bias. With recall bias, data may be reported inaccurately, either intentionally or unintentionally, and can reduce the internal validity of the study (Hassen, 2006). To increase validity and reliability of the food recall interview, dietary interviewers used a computerized

template, called the Automated Multiple-Pass Method (AMPM), for asking questions and recording data. This method prompted the interviewer to ask additional questions based on responses given, records foods, amounts and time of day consumed, probes for often forgotten foods, and records and edits the data entered. Interviewers used the AMPM for both the in-person and telephone dietary recalls. Results entered into the AMPM were analyzed for nutrient content using the USDA's Food and Nutrient Database. This was a database of foods represented by codes. By using this database, researchers were able to determine the specific nutrient content of individual foods consumed and total caloric and nutrient intakes on each recall day (USDA, ARS, 2008). Research by Casey, Goolsby, Lensing, Perloff, and Bogle (1999) suggested that there were no significant differences in mean nutrient intakes when dietary recalls were administered over the telephone when compared to dietary recalls administered in person.

A second limitation in this study centered on the use of secondary data which limited some potential areas of investigation. One area that was limited in this study was the inability to determine from NHANES data how many children lived in the household surveyed and their ages. Being able to compare adults' nutrient intake to the number of children in the home would have been interesting to analyze. However, if significant correlations were found between adult's nutrient intake and presence of children in the home, then this allows for the possibility of future research that could look more in-depth at how the number of children in the household effect nutrient intakes.

The use of secondary data also limited the full use of the Food Choice Process Model. This researcher attempted to choose the best variables to represent the constructs within the model, but was limited to the variables contained within NHANES. Future research could

examine a current population in which variable to examine could be chosen based on the model and population.

Finally, the use of NHANES data that looked at just individuals aged 18 to 50 years who were not pregnant caused a minimal lack of generalizability of results for individuals who were institutionalized, non-civilian, pregnant women, below the age of 18 years, and above the age of 50 years. However, when defining the age of parents or those adults with children age 17 years and under in the home, the age range of 18 to 50 years seemed appropriate. The average median age in 2005 for a woman to have her first child was 25.2 years (CDC, *Births: Final Data for 2005*, 2007) which means one can assume she would have a child in the home until she was 42.2 years old. Since the data is from a large nationally representative sample, generalizability was not considered a large limitation.

It is assumed that the NHANES 2007-2008 and NHANES 2005-2006 dietary interviews were valid and accurate as reported by the interviewee and as recorded by the interviewer. This validity was greatly increased by the use of the AMPM. To further increase the validity of the data, the researcher used only adults with two complete days of dietary recall. It was also assumed that the two days of dietary recall collected represented the participant's usual intake. Again, averaging the nutrient totals from the two days of recall data helped prevent unusual, atypical consumption from skewing data. Extreme outliers were eliminated from the data set.

## Products

The researcher produced two manuscripts from this study. One manuscript focused on the nutrient intake and adequacy of adults with and without children in the home and answer research questions one and two (Chapter 2). The second manuscript focused on the frequency of meals prepared away from home and nutrient intake and adequacy among adults (Chapter 3).