RELATIONSHIPS BETWEEN DIETARY INTAKE AND BODY MASS INDEX OF PRIMARILY LOW-INCOME, AFRICAN AMERICAN CHILDREN AND THEIR FEMALE CAREGIVERS LIVING IN RURAL ALABAMA

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RELATIONSHIPS BETWEEN DIETARY INTAKE AND BODY MASS INDEX OF PRIMARILY LOW-INCOME, AFRICAN-AMERICAN CHILDREN AND THEIR FEMALE CAREGIVERS LIVING IN RURAL ALABAMA

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A Thesis

Submitted to

the Graduate Faculty of

Auburn University

in Partial Fulfillment of the

Requirements for the

Degree of

Master of Science

Auburn University

August 8, 2005

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Erin Brooke Sharp, daughter of Danny Sharp and Diane Sharp, was born June 18, 1981 in Decatur, Alabama. Erin graduated with honors from Arab High School in Arab, AL, in 1999. She attended Snead State Community College for one year before entering Auburn University in 2000 where she received her Bachelor of Science degree in Nutrition and Food Science in May, 2003. In August, 2003, she entered the graduate program in the Department of Nutrition and Food Science at Auburn University.

THESIS ABSTRACT

RELATIONSHIPS BETWEEN DIETARY INTAKE AND BODY MASS INDEX OF PRIMARILY LOW-INCOME, AFRICAN AMERICAN CHILDREN AND THEIR FEMALE CAREGIVERS LIVING IN RURAL ALABAMA

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Master of Science, August 8, 2005
(B.S., Auburn University, 2003)

93 Typed Pages

Directed by Dr. Sareen Gropper

The relationships between body mass index and dietary intake were examined in 110 primarily African American children and their caregivers from three rural counties (Bullock, Macon, and Wilcox) in Alabama. Children were 9 to 13 years of age and included 76 girls and 34 boys; 108 children were African American and two were Caucasian. Children attended schools in which over about 90% of the school children received free or reduced price lunch. Caregivers were female with an age range from 17 to 93 years. The prevalence of overweight among the children was 36.1% and when

children at risk of overweight were included, the prevalence was 56.5%. The prevalence of overweight and obesity among the female caregivers was 66.3%. Significant positive correlations were found between caregivers and boys for intakes of energy, protein, fat, saturated fat, cholesterol, fiber, phosphorus, iron, magnesium, zinc, potassium, sodium, thiamin, riboflavin, niacin, folate, vitamin B6, and vitamin A. No significant correlations were found between caregivers and girls for any nutrient intakes. Significant correlations were found for intakes of fruit, vegetables, and meat between the caregivers and the boys. No correlations were found between caregiver and girls for any of the food groups. No significant correlation was found between the caregivers' BMI and the boys' BMI. A significant positive correlation was found between the caregivers' BMI and the girls' BMI. No significant correlation was found between the boys' BMI and the boys' energy or macronutrient intakes. A significant positive correlation was found between the girls' BMI and the girls' intake of energy, protein, carbohydrate, fat, and fiber. These findings suggest that in this population group, caregivers influence, although only to a minor extent, the dietary intakes of fourth and fifth grade boys. The influence appears to be the greatest for intakes of protein, iron, and vitamin B6 and consumption of foods from the meat, fish, and poultry group.

ACKNOWLEDGEMENTS

The author would like to express immense appreciation to Dr. Sareen Gropper for her time, guidance, advice, and support throughout the preparation of this thesis. Gratitude is also extended to committee members Dr. Doug White and Dr. Robert Keith for their review and recommendations of the thesis. The author would also like to offer thanks to Erin Gilmore and other fellow graduate students for their advice and assistance in data collection. Lastly, the author would like to thank her family and fiancé for their love and support throughout her educational experience at Auburn University.

Style manual or journal used Journal of Food Science

Computer Software used Microsoft Word, Microsoft Excel, JMP

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CHAPTER 1

INTRODUCTION

Obesity is considered an epidemic in the United States among both adults and children. The United States has the highest percentage of obesity in the world with approximately 65% of adult Americans classified as overweight or obese and 31% of children and adolescents aged 6 to 19 years overweight or at risk for overweight (Hedley and others 2004). Obesity can have adverse health effects including increased risk for cardiovascular disease, type 2 diabetes, certain cancers, and even death. Although obesity rates are problematic nationwide, the highest rates occur in the southeastern states. Alabama has the highest prevalence of obesity in the nation (CDC 2003a). There are also unequalities in obesity rates among racial groups with African Americans and Mexican Americans having a greater prevalence than whites. In addition, people of low socioeconomic status and of low education tend to have higher rates of obesity and overweight than those with greater socioeconomic status and education (ADPH 2003, CAS 2002, Mokdad and others 1999).

There are several causes of obesity and overweight. Decreased energy expenditure due to lifestyle, decreased physical activity, and more sedentary behavior without a decrease in energy intake ultimately leads to obesity. Furthermore, increased energy intake above energy needs can lead to obesity in children and adults and can be attributed to a number of factors. Marketing of energy dense foods and beverages,

consumption of sugar-sweetened beverages, and increased consumption of fast foods and foods from restaurants all contribute to increased energy intake in the United States. Among children, the increased obesity rates also can be attributed to parental influences. Parents influence the food choices, dietary practices, as well as nutrient intakes of their children (Birch and Fisher 1998, Feunekes and others 1998, Fisher and others 2002, Gibson and others 1998, Kremers and others 2002, Laskarzewski and others 1980, Oliveria and others 1992, Patterson and others 1988). This study examined relationships of dietary intake and body mass index of primarily limited-income, African American elementary school aged children and their female caregivers in rural Alabama.

CHAPTER II

LITERATURE REVIEW

The literature review addresses the prevalence of obesity, definitions, dietary assessment methods, adverse health consequences associated with excess body fat, energy balance and overweight, and factors influencing energy balance, specifically decreased energy expenditure and increased energy intake. The section on increased energy intake will primarily focus on parental influence on children's diet and body mass index and the relationships of dietary intake between children and their parents.

Prevalence of Obesity

The most recent data from the National Health and Nutrition Examination Survey (NHANES) 1999-2002 show increases in body mass for both men and women in all age groups versus previous NHANES studies conducted in 1988 to 1994. Data from the 1999-2000 survey revealed that 65.1% of adult Americans were overweight (BMI $\geq$ 25) or obese (BMI $\geq$ 30), while 30.4% of this population was obese (Hedley and others 2004). Similar findings have been observed in children (Hedley and others 2004). During the past two decades, the percentage of overweight children has more than doubled (6.5% to 15.8%), and the percentage of adolescents who are overweight has tripled (5.0% to 16.1%). It is estimated that 15.8% of children aged 6 to 11 years are overweight and 16.1% of adolescents aged 12 to 19 years are overweight (Hedley and

others 2004). The estimated direct and indirect costs of obesity and overweight in the United States are $117 billion and rapidly rising (ADPH 2003).

The prevalence of obesity is greater in certain populations depending on race, socioeconomic status, education level, and geographic location. African American and Mexican American adults have a greater prevalence of overweight and obesity than white adults (non-Hispanic). Data from the 1999-2002 NHANES revealed that 70.7% of black adults (non-Hispanic) were overweight and obese and 39.4% were obese; 72.5% of Mexican American adults were overweight and obese and 32.6% obese; and 63.3% of white adults (non-Hispanic) were overweight and obese and 29.4% obese (Hedley and others 2004).

Racial and ethnic disparities in overweight also occur in children and adolescents. From 1986 to 1998, obesity among black and Hispanic children increased by more than 120% compared to only about 50% among white children. In addition, more boys were found to be overweight than girls (CAS 2002). According to NHANES 1999-2002, 13.5% of non-Hispanic white, 19.8% of non-Hispanic black, and 21.8% of Mexican American 6 to 11 year olds were overweight. Among adolescents, aged 12 to 19 years, 13.7% of non-Hispanic whites, 21.1% of non-Hispanic blacks, and 22.5% of Mexican Americans were overweight (Hedley and others 2004). Similar differences in prevalence of overweight among races have been reported in other studies. For example, the National Heart, Lung, and Blood Institute Growth and Health Study on overweight children found a higher mean body mass index for black girls aged 9 and 10 years compared to white girls of the same ages (Gleason and Suitor 2001).

People of low socioeconomic status and with a lower family income appear to be particularly affected by overweight and obesity. Non-Hispanic white adolescents from lower income families experience a greater prevalence of overweight than those from higher income families (Gleason and Suitor 2001). One national study reported that approximately 34% of children from lower income households were obese compared to 19% of children from higher income households (CAS 2002). In 1999, 16.1% of Alabama's population lived below the poverty level compared with 12.4% people living below the poverty level nationwide (Census 2000). The prevalence of obesity was 30.9% among Alabamians with annual incomes at or below $15,000 versus 20.8% among those with incomes at or above $75,000 (ADPH 2003).

The South Atlantic and East South Central regions of the United States exhibit the greatest obesity rates (Mokdad and others 1999). Twenty-eight percent of children from the South are obese whereas only 22% of children from other regions of the country are obese (CAS 2002). Alabama is ranked first in the nation, with 28.4% of adults obese and 34.8% of adults overweight (CDC 2003a). Counties in the lower third of the state of Alabama have been found to have higher percentages of adults at risk for obesity and obesity-related problems versus more central and northern areas of the state (ADPH 2003).

Education and obesity also appear to be linked. In adults, an inverse relationship between level of education and the incidence of obesity has been documented (Mokdad and others 1999). Obesity was found in 26.3% of adults with less than a high school education compared with 18.5% among college graduates (ADPH 2003). Mokdad and

others (1999), however, found the greatest magnitude of increase in obesity among individuals with some college education (Mokdad and others 1999).

Definitions

"At risk of overweight" and "overweight" are terms used by the Centers for Disease Control (CDC) that refer to children and adolescents whose excess body weight could pose medical risks. "Overweight" is preferred because of the negative connotations associated with "obesity." According to CDC growth charts, at risk of overweight for individuals aged 2 to 20 years is defined as a body mass index (BMI)-for-age between the 85^{th} and 95^{th} percentiles. Overweight in children is defined as a BMI-for-age at or above the 95^{th} percentile on the charts (CDC 2003b).

For adults 20 years or older, overweight is defined as having a BMI of 25 to 29.9 kg/m^2. Obesity is defined as having a BMI of 30 to 39.9 kg/m^2, and severe obesity is a BMI of 40 kg/m^2or higher (Ogden and others 2002). BMI is calculated as weight (in kilograms) divided by height (in meters) squared (kg/m^2). BMI compares well to laboratory measures of body fat, and therefore, is thought to be a valid measurement of body mass in children and adults (CDC 2004a, CDC 2004c).

Dietary Assessment Methods: The Food Frequency Questionnaire

Measuring the dietary intakes of individuals can be a tedious task and requires reliable and valid methods. McPherson and colleagues (2000) studied the validity and reliability of dietary assessment methods used for school-aged children and for specific age, gender, and ethnic groups; some of their findings are presented hereafter.

The food frequency questionnaire (FFQ) measures usual food intake, is relatively easy to administer, is less expensive than other methods, and is easily adapted for

population studies. Respondents are asked to report frequency of consumption and sometimes portion size for a defined list of foods over a defined period of time, usually within the past year, month, or week. Reporting of portion sizes permits calculation of nutrient intakes. The questionnaire is either self-administered or conducted with assistance. The procedure does not alter dietary habits and the total diet or selected foods or nutrients can be assessed. These measures can be used to rank respondents by intake levels and are useful for predicting health outcomes at both the group and the individual level (McPherson and others 2000).

Food frequency questionnaires with long, detailed lists of foods generally showed better agreement with other dietary assessment tools than did food frequency questionnaires with short lists of broad food categories (McPherson and others 2000). Food frequency questionnaires, however, overestimated energy intakes when compared with multiple food records, a single 24-hr recall, or total energy expenditure (measured by doubly labeled water). Yet, use of multiple 24-hour recalls versus FFQ generated similar mean energy intake data. The nutrients that were most frequently overestimated in the FFQs included total fat, polyunsaturated fatty acids, fiber, and calcium. The first administration of the FFQ also was found to result in higher reported energy and nutrient intakes and greater frequencies of consumption than subsequent administrations (McPherson and others 2000).

Disadvantages of the FFQ include the reliance on the memory of the individual. In addition, specific food descriptions are not obtained (McPherson and others 2000).

Adverse Health Consequences Associated with Excess Body Fat

It is estimated that 300,000 deaths a year may be attributable to obesity (Allison and others 1999, McGinnis and Forge 1993). Mortality increases with obesity and individuals with a BMI $\geq$ 30 have a 50 to 100% increased risk of premature death from all causes compared with individuals with a BMI in the range of 20 to 25 kg/m^2 (Gleason and Suitor 2001). More commonly, overweight and obesity are associated with an increased risk for certain diseases in adults and children. In adults, overweight can lead to increased risk of coronary heart disease, hypertension, stroke, type 2 diabetes, endometrial, colon, postmenopausal breast, and other cancers, and musculoskeletal disorders, such as osteoarthritis (Gleason and Suitor 2001). Excess body fat in children is also associated with cardiovascular risk factors such as high blood pressure, high cholesterol, and type 2 diabetes, as well as sleep apnea, asthma, and psychological disorders, such as depression. Moreover, overweight children are more likely to become overweight adults (CDC 2003d, CDC 2005e).

Alabama has the highest rate of diabetes (9.6% of population) in the nation, which can be attributed to its high percentage of obesity. The Alabama age-adjusted death rate rankings for obesity-related diseases are among the highest in the nation: 5^{th} for heart disease, 7^{th} for stroke, and 10^{th} for diabetes (ADPH 2003).

Overweight and obesity is a complex disease and can be attributed to a number of factors. Overweight and obesity can be characterized by long-term energy imbalance due to sedentary lifestyle, excessive caloric consumption, genetics, the environment, or any combination of these factors. The exact cause of obesity is unclear, but research has

shown that the integration of social, behavioral, cultural, physiological, metabolic, and genetic factors all contribute to its development (NIH 1998).

Overweight and obesity result from an energy imbalance whereby more energy is ingested than is expended in physical activity. The social and economic environment can encourage the consumption of excess energy and discourage energy expenditure (Golan and Crow 2004). Each of these areas will be addressed in the next section of the literature review.

Decreased Energy Expenditure

Insufficient physical activity in children and adults is a risk factor for obesity. Decreased participation in physical education programs in schools and more sedentary lifestyles are two contributors to this decline in physical activity. In 1997, less than one-third of adults engaged in the recommended 30 minutes of moderate physical activity most days of the week and 40% of adults engaged in no physical activity at all (Gleason and Suitor 2001). According to the Centers for Disease Control and Prevention Youth Risk Behavior Survey conducted in 2003, only 28.4% of students in ninth through twelfth grades participated in a physical education class at school five days a week, whereas in 1991 this percentage was 46%. In the state of Alabama, the percentage of students who participated in daily physical education classes was 33.3% (CDC 2004f). In 2003, according to the CDC's Behavioral Risk Factor Surveillance System, 52.8% of adults aged 18 years and over throughout the United States did not meet the recommended guidelines for moderate physical activity. The percentage of Alabamians that reported not meeting physical activity guidelines was 59.6% (CDC 2003g).

The National Longitudinal Study of Adolescent Health (1995), a nationally representative, school-based sample of 20,000 adolescents in grades 7 to 12 in the United States found that activity and inactivity patterns differ by ethnicity, with minority groups engaging in less physical activity and more inactivity than non-Hispanic whites (Gordon-Larsen and others 1999). One third of study participants in the Gordon-Larsen et al. study failed to achieve these recommendations. Failure was highest among non-Hispanic blacks (36.7%) and lowest for non-Hispanic whites (31.2%). These findings suggest that minorities, especially Hispanics and non-Hispanic blacks, do not get sufficient physical activity (Gordon-Larsen and others 1999).

Increased sedentary activities also can contribute to obesity. Television use contributes to sedentary lifestyle. Approximately 43% of high school students watch more than two hours of television on school days and 26% of children aged 8 to16 years watch four or more hours of television per day (CAS 2002). Inactivity, particularly TV viewing, has been associated with obesity in cross-sectional studies of children, adolescents, and adults. The National Longitudinal Study of Adolescent Health also looked at television in relation to physical activity (Gordon-Larsen and others 1999). Mean hours of TV viewing per week were highest for males, particularly for non-Hispanic black males, but also for non-Hispanic black females. Values were lowest for non-Hispanic white males and females. Inactivity was highest among non-Hispanic black males and females and lowest for non-Hispanic white males and females. Only one-third of adolescents reported that they participated in five or more episodes of moderate to vigorous physical activity per week, and activity was higher for males than females (Gordon-Larsen and others 1999).

Utter and others (2003) studied BMI, dietary behaviors, and leisure time physical activity among 4,480 middle and high school students. This study used student survey and anthropometric data from Project EAT (Eating Among Teens) collected in 1998-99. Boys' television/video use and time spent reading/doing homework and girls' television/video and computer use were significantly and positively associated with BMI. High television/video use among both boys and girls also was associated with more unhealthy dietary behaviors. Time spent reading/doing homework for boys and girls was associated with more healthful behaviors (Utter and others 2003).

Family lifestyle also can play a critical role in determining children's activity. Sallis and others (2000) in a comprehensive review found that parental support, direct help from parents, sibling physical activity, and opportunities to exercise were most associated with children's physical activity (Sallis and others 2000). According to Moore and others (1991), parents who were more physically active were more likely to have children who were physically active (Moore and others 1991).

Increased Energy Intake

Increased energy intake can lead to obesity when more energy is consumed than is needed by the body. Many factors, such as marketing of foods, increased consumption of soft drinks, and increased eating of foods away from home contribute to an increase in energy intake, and therefore, increase the risk of obesity in children and adults. These factors will be briefly reviewed hereafter. Parents also can have a tremendous influence on their children's energy intake. Parental control of their children's diet and the dietary practices of parents may influence the nutrient intakes of their children. Various aspects

of parental control over the diets of their children also will be discussed in the following subsections of the literature review.

Marketing

The food industry spends approximately $26 billion annually on advertising (Variyam and Golan 2002). Television exposes children to a multitude of food and beverage advertisements. Food advertisements are the largest single category of products advertised during children's television shows. Snack foods and breakfast cereals make up more than half of these advertisements (Barcus 1980). Soft drinks also are heavily marketed, and companies aim advertising campaigns at children in efforts to develop lifetime brand loyalties (Nestle 2002). Lewis and Hill (1998) looked at the content and style of television commercials during children's television and found that these advertisements contained more animation, humor, happiness, and fun. When children were exposed to such advertisements, they were more likely to ask for the foods and beverages being advertised and, therefore, influence their dietary patterns (Lewis and Hill 1998).

Sugar-Sweetened Beverage Consumption

Children and adults who consume sugar-sweetened beverages on a regular basis consume less nutrients and added calories, placing them at a higher risk for overweight (Cullen and others 2002). Soft drinks supply about 22% of daily calories for children ages 6-11 years and 33% of daily calories for all people 2 years of age and older (Guthrie and Morton 2000). Students in schools that have access to vending machines with sodas and snack foods are less likely to consume fruits, juice, milk, and vegetables than students who attend schools who do not have these machines. About 60% of middle and

high schools in the United States sell soft drinks in vending machines (Fried and Nestle 2002).

Cullen and others (2002) looked at the intake of sugar-sweetened beverages by 504 children in grades 4 through 6. Students with the highest consumption of sweetened beverages consumed about 330 more calories per day than those who did not consume sweetened beverages. African-American students reported the highest fruit-flavored drink consumption and Mexican-American students reported the highest soft drink consumption. In addition, students who consumed more sweetened beverages consumed significantly less fruits and more high-fat vegetables, such as french fries, than children who did not consume as many sweetened beverages. It also was noted that students whose parents had a high school education or less consumed more soft drinks and total sweetened beverages than students whose parents had more education (Cullen and others 2002).

As soft drink consumption among children has increased in the United States, milk consumption has declined (Borrud and others 1997, Putnam and Gerrior 1997). Parents may have an influential role in their children's pattern of drink consumption by deciding what types of beverages are available in the household. Fisher and others (2000) found that mothers with more frequent regular soft drink intake had daughters with more frequent intakes of soft drinks. In addition, they found that mothers' milk intake had a positive influence on their daughters' milk intake (Fisher and others 2000).

Consumption of Meals Away From Home

In 1994-95, 57% of Americans consumed at least one food item away from home daily compared to 43% in 1977-78 (Lin and others 1999). Children and adolescents

consumed between 25% and 30% of their meals away from home. Fast-food restaurants accounted for more than half of away-from-home meals (Lin and others 1999).

The frequency of consuming food from restaurants is positively associated with increased body weight in adults (McCroy and others 1999). Fast-foods tend to be higher in energy and fat; therefore, consumption of these foods on a frequent basis may explain the rising prevalence of obesity (Coll and others 1979).

Increasing Portion Sizes

In addition to eating away from home, larger portion sizes are thought to be contributing to the increasing prevalence of overweight among children and adults (Hill and Peters 1998). A comparison of food service portion sizes from 1957 to 1997 demonstrated the tremendous increase in portion sizes in the United States. For example, the typical fast-food hamburger contained about an ounce of cooked meat in 1957 compared to a six ounce burger in 1997. The average soda was eight ounces in 1957 compared with 32 to 64 ounces in 1997. A typical muffin weighed less than 1 ½ ounces in 1957 compared with five to eight ounces in 1997. These increases reflect an increased food supply (Putnam and Allshouse 1999). Moreover, studies have shown that adults and children consume greater amounts of foods when served larger portions (Hill and Peters 1998, Rolls and others 2000).

Young and Nestle (2002) measured and compared 181 foods sold for immediate consumption in the most popular take-out establishments, fast-food outlets, and family-type restaurants with those offered in the past and with USDA and FDA standards. All of the commonly available food portions exceeded USDA and FDA portions. The largest excess occurred in the cookie category with current cookie sizes being 700% above

USDA standards. Cooked pasta, muffins, steaks, and bagels also exceeded standards by 480%, 333%, 224%, and 195%, respectively. Serving sizes for common fast food items such as french fries, hamburgers, and soda are currently two to five times larger than when they were originally introduced. This trend toward larger portion sizes began in the 1970s, increased sharply in the 1980s and is continuing to increase in the first decade of the 21st century (Young and Nestle 2002).

Parental Influence on Children's Dietary Intakes

Parents influence the foods chosen and nutrients consumed by children (CAS 2002). Parents control the availability and accessibility of foods, plan family meals, and control food socialization practices and dietary intake patterns. Parental knowledge of nutrition and the behavior and attitude of the parents towards food are also influential (Golan and Crow 2004). In addition, the dietary composition and nutrients consumed by parents and their children tend to have strong similarities suggesting that parents influence the food choices of their children.

Family Meals

Neumark-Sztainer and colleagues (2003) examined family meal patterns and associations with sociodemographic characteristics and dietary intake in adolescents using data from project EAT (Eating Among Teens). Fifty-three percent of adolescents reported different schedules as the reason for irregular family meal patterns. On average, adolescents reported eating meals with "all or most" of their family living in their home 4.5 times (SD=3.3) in the past week. Fourteen percent reported "never" for eating meals with their family the past week and 18% reported more than seven times. Youths that consumed more meals with their families reported healthier dietary intakes containing

more fruits, vegetables, grains, and calcium-rich foods, and less soft drinks than children who did not eat with their families as often (Neumark-Sztainer and others 2003). Positive correlations also were found between frequency of family meals and energy, protein as a percentage of total calories, calcium, iron, folate, fiber, and vitamins A, C, E, and B6 intakes (Neumark-Sztainer and others 2003).

Food Preferences

Parents are role models to their children and shape their children's eating environments in a variety of ways. Parents choose the infant feeding method, foods they make available and accessible, and directly model eating behavior in the home. Food behaviors of mothers' with regard to time and place of eating, and types of foods liked and disliked are correlated with child's food behaviors (Golan and Crow 2004).

Although Mennella and colleagues (2001) demonstrated that exposure to flavor can occur via the amniotic fluid in utero or via breast milk after birth, parents or caregivers control exposure after birth and, thus, have greater influences (Menella and others 2001). Skinner and others (2002) conducted a longitudinal study of child/mother pairs assessing food preferences and consumption. The children were studied from age 2 months to 8 years. Mothers completed a food preference questionnaire for children at 2 to 3 years, 4 years, and 8 years of age. Few positive changes occurred in children's food preference during the 5-year period. The leading foods liked by children were breads, desserts, snack foods, and meats that are available in fast food restaurants. Vegetables made up 17 of the top 24 disliked foods. Mother and children agreed on at least 50% of the foods such that the foods most liked by children were most liked by mothers and the foods most disliked by children also were disliked by mothers. Many foods never tasted

by children were foods disliked by mothers. These findings indicate that mothers do not introduce their children to foods that they dislike themselves (Skinner and others 2002).

Alderson and Ogden (1999) also examined the association between mothers' food preferences and the foods they fed their children. Caucasian mothers or female caregivers (n = 413) of children aged 5 to 11 years who were registered at a Health Center outside of Cambridge, MA participated in the study. Mothers were asked to indicate foods they ate most often and their reasons for food selection for both themselves and their children. The mothers also were asked to indicate their level of dieting behavior. The researchers found that mothers fed their children less healthy breads, cereals, potatoes, and dairy products, and more sweets than they fed themselves. Overall, mothers fed themselves significantly more healthy foods than their children and they fed themselves significantly less of the less healthy foods. When asked about what motivated the mothers to choose the foods for themselves, the responses indicated that mothers focused on energy content, availability, and cost of food for themselves. When choosing food for their children, the mothers indicated they focused more on the long-term nutritional value (Alderson and Ogden 1999).

Parental Control, Inhibition, and Disinhibition

Several studies have looked at parental control and attitudes and their children's dietary behaviors. Parental feeding behaviors affect the eating behaviors of children and adolescents. Parents who are highly controlling and restrictive when it comes to food for their children actually contribute to positive energy balance and higher body mass index by interfering with children's ability to self-regulate energy intake (Golan and Crow 2004). Fisher and others (2002) found that parents' fruit and vegetable intakes were

negatively related to their use of pressure in child feeding. Parents with lower fruit and vegetable intakes tended to report using greater pressure in child feeding. Daughters who received more pressure to eat tended to have lower fruit and vegetable and micronutrient intakes than daughters not pressured to eat. Parents who used the most pressure in child feeding had daughters who consumed 1.6 fewer servings of fruits and vegetable, 155 μg RE less vitamin A, and 50 μg less folate than did those girls whose parents used the least pressure (Fisher and others 2002).

The Framingham Children's Study conducted in 1987 is a prospective study of the determinants of dietary habits and physical activity patterns throughout childhood. Hood and others (2000) used data from this study to examine the extent to which parent's degree of dietary self-control affected the development of excess body fat in children. Children (36 girls and 56 boys) aged 3 to 5 years for who anthropometric data were available were assessed at baseline and for the next six years. The interactions of dietary restraint and disinhibition on the change in the child's anthropometry over the six-year period were assessed. The mean values of the parents' scores were used to classify each family into one of four groups according to extent of restraint and disinhibition. The researchers showed that in families with higher levels of dietary restraint, mothers and fathers had higher mean BMIs. Children whose parents reported higher levels of dietary restraint or disinhibition had greater increases in their BMI, triceps and sum of skinfolds over six years than those whose parents had the lowest levels of restraint and disinhibition. Children whose parents had a high level of dietary restraint combined with a low disinhibition score had the smallest increases in body fat (36.9 mm), while those whose parents had high scores on both factors had the greatest gains (61.4 mm gain in

sum of skinfolds). Researchers also examined the effect of controlling for each parent's BMI to determine if there was a difference in mothers and fathers influences. The researchers found that the mother's obesity had a stronger effect on the child's body fat change than did the father's level of obesity (Hood and others 2000).

Kremers and others (2003) examined the environmental influence of parenting style on adolescent food consumption, specifically fruit consumption. Data were collected on 643 Dutch adolescents with a mean age of 16.5 years using self-administered questionnaires on parenting style and fruit intake behavior. Parenting styles were classified as authoritative, indulgent, authoritarian, and neglectful. Authoritative and indulgent were the parenting styles in which the parents had high involvement and responsiveness to their children's fruit consumption. Kremers and others (2003) found that adolescents raised in authoritative homes showed the healthiest behaviors, attitudes, as well as cognition in regard to fruit consumption. They also found that children of parents with indulgent parenting styles consumed more fruit than adolescents from authoritarian or neglectful homes (Kremers and others 2003).

Children can learn to appreciate a variety of nutritious foods by being exposed to them at an early age. Parents control most of the foods that enter the home, the way the food is prepared, and what restaurant the family chooses (Hearn and others 1998). Children choose to eat foods that are served most often and prefer what has been available and acceptable in their home. Children learn which foods they like through repeated exposure to foods (Golan and Crow 2004). Availability and accessibility accounted for 35% of the variability in fruit, juice, and vegetable consumption among elementary school girls (Johnson and Birch 1994). In families where energy-dense foods

are widely available and accessible, children may learn to have a greater preference for these foods (Birch and Fisher 1998).

Parents may use several different strategies for controlling their child's food intake. Parents of children with unhealthy eating habits tend to press their children to behave differently. Fisher and others (2002) found that parents with lower fruit and vegetable intake tend to report using greater pressure in child feeding. This pressure in child feeding was then negatively related to their fruit and vegetable intake and positively related to their fat intake (Fisher and others 2002). Birch and Fisher (1998) have suggested that parental insensitivity and/or unresponsiveness to feeding cues from the child might be counterproductive to the development of the child's ability to self-regulate and may have adverse consequences for the development of child's food preferences and intake. This behavior may discourage children from making choices based on individual food cues and a cause the child to focus on cues other than feelings of hunger and satiety (Birch and Fisher 1998).

In a study conducted by Cutting and colleagues (1999), parent-child similarities in overweight were found to be mediated by parents' dietary restraint and disinhibition, primarily among mothers and daughters. Heavier mothers had heavier daughters, maternal disinhibition was positively related to daughters' overweight, and higher maternal disinhibition was related to higher free access intake by daughters (Cutting and others 1999).

When young adults were asked about their eating habits as a child, they reported that certain practices carried over into adulthood (Branen and Fletcher 1999). Finishing all the food on their plate, using food as an incentive or threat, eating dessert, and eating

regularly scheduled meals were feeding practices that had been used by their parents. The young adults also considered the nutritional value when selecting food depending on their memory of parents talking about nutrition during childhood (Branen and Fletcher 1999).

Parents have an important impact on the way children view their bodies. Birch and Fisher (1998) found that mothers' dietary restraint and perceptions of their daughters' risk of overweight predicted maternal child-feeding practices, which in turn predicted daughters' eating patterns and relative weight (Birch and Fisher 1998). The Framingham Children's Study suggested that children, aged 3 to 5 years, whose parents exert more restraint and control over their diets over a six-year period had higher BMI's than children of parents that did not exert as much restraint (Hood and others 2000). The authors suggest that this association may result from the role modeling of poor parental eating habits and as a result the child gaining negative eating behaviors for themselves. The study also found that the mother's obesity had a stronger affect on the child's body fat than did the father's level of obesity (Hood and others 2000). According to Fisher and Birch (1999), mothers tend to have equal control over the diets of both their sons and daughters. However, Tiggemann and Lowes (2002) found that mothers make more effort with their daughters than their sons to ensure that they do not put on weight. This is because in western societies it is generally more acceptable for a woman to be thin than overweight (Tiggemann and Lowes 2002). Even though parents believe that they are helping their children and encouraging proper eating habits, they may have more negative effects, with children increasing their consumption of restricted foods and gaining weight (Fisher and Birch 1999).

Relationship between parental and children's nutrient intakes

Few investigators have examined links among parental adiposity and nutrient intakes and children's adiposity and nutrient intakes. Five studies which have addressed relationships of nutrient intakes or adiposity between parents and children will be presented in this section of the literature review.

Data from the 1987 Framingham's Children's Study were used to assess relationships between nutrient intakes of 91 children, aged 3 to 5 years, and their parents (87 mothers, 83 fathers). All subjects were Caucasian and resided in the Framingham, Massachusetts area during the study period (Oliveria and others 1992). Nutrient intakes were more highly correlated between mothers and their children than between fathers and their children. Significant correlations between parent and child intake were found for all nutrients except potassium, with the highest correlations for protein ($r = 0.37$), saturated fatty acids ($r = 0.47$), and cholesterol ($r = 0.41$) intake. Children with both parents consuming high amounts of saturated fat were 5.5 times more likely to be eating a high amount of saturated fat than children in families in which neither parent was consuming a diet high in saturated fat. Significant correlations also were found between parents and children's intakes of carbohydrates ($r = 0.31$), total fat ($r = 0.32$), monounsaturated fatty acids ($r = 0.29$), polyunsaturated fatty acids ($r = 0.27$), sodium ($r = 0.27$), and calcium ($r = 0.30$) (Oliveria and others 1992).

Fisher and Birch (1995) investigated the preferences of high fat foods of 3 to 5 year old children in relation to their own and their parent's adiposity. Children (unspecified ethnicity) were recruited from programs at the University of Illinois Child Development Laboratory. Parental BMI was positively associated ($r = 0.75$) with

children's fat preferences; children of heavier parents had strong preferences for high-fat foods. Parental adiposity also was positively correlated ($r = 0.67$) with the percentage of energy children consumed as fat. Children's fat intakes ranged from 25% to 41% of energy intake. The results of this study revealed that differences among children in preferences for high-fat foods are reflected in their macronutrient intakes. Children who indicated high preferences for high-fat foods consumed a relatively high percentage of total energy as dietary fat. Children's fat preferences and consumption were strongly related to their parents' adiposity. Parents may have the capacity to shape children's preferences for high-fat foods through frequent consumption of high-fat foods or by making high-fat foods routinely available or accessible to their children (Fisher and Birch 1995).

Patterson and others (1988) examined relationships in energy, fat, and sodium intakes between parents (95 Anglo and 102 Mexican American) and their 5^{th} and 6^{th} grade children (mean age 11.5 years) and their older children in the household (mean age 13.3 years). Mothers and their 5^{th} and 6^{th} grade children had significant ($p < 0.05$) correlations for intakes of energy ($r = 0.35$ for Anglos, $r = 0.21$ for Mexican Americans), sodium ($r = 0.24$ for Anglos, $r = 0.21$ for Mexican Americans), and total fat ($r = 0.37$ for Anglos, $r = 0.20$ for Mexican Americans), assessed via a 24-hour recall. Fathers and their 5^{th} and 6^{th} grade children had significant correlations for fat intake ($r = 0.32$) and sodium intake ($r = 0.84$) for the Anglo group only. No significant correlations were found for fat, sodium, or energy intakes between mothers and their older children in the household for fat, sodium, or energy intakes between fathers and their older children (Patterson and others 1988).

Feunekes and others (1998) studied nutrient intake between 15-year-old adolescents and their parents living in the Netherlands. Subjects were 309 mothers, 270 fathers, 201 girls, and 146 boys. Associations in intakes of several nutrients between mothers and children were significant; nutrients for which significant associations were found between mothers and children include energy ($r = 0.19$), total fat as a percent of energy ($r = 0.19$), saturated fat as a percent of energy ($r = 0.23$), monounsaturated fat as a percent of energy ($r = 0.20$), and polyunsaturated fat as a percent of energy ($r = 0.38$). No significant associations between mother and child were found for body mass index or for cholesterol. Similar significant associations were found between fathers and children for energy ($r = 0.13$) and for total fat ($r = 0.18$), saturated fat ($r = 0.24$), monounsaturated fat ($r = 0.26$), and polyunsaturated fat ($r = 0.16$) as a percentage of energy (Feunekes and others 1998).

Laskarzewski and associates (1980) examined energy, carbohydrate, polyunsaturated fat, saturated fat, and cholesterol intakes (assessed from dietary recall) between 294 parents (60 black, 234 white) and their children aged 6 to 19 years. Intakes of carbohydrate ($r^2 = 0.92$), saturated fat ($r^2 = 0.65$) and energy ($r^2 = 0.81$) between black mothers greater than 40 years of age (but not less than 40 years of age) and their children were significantly correlated. Carbohydrate intakes were significantly correlated ($r^2 = 0.97$) between black fathers over 40 years of age and their children. Intakes of saturated fat ($r^2 = 0.47$) and energy ($r^2 = 0.67$) between white mothers aged less than 34 years (but not greater than 34 years) and their children were significantly correlated. Saturated fat intake was significantly correlated ($r^2 = 0.40$) between white fathers and their children.

Relationship between parental and children's food group intake

The food groups eaten most often or least often by children are influenced by the food groups eaten most often or least often by their parents or primary caregiver. Fisher and others (2002) found that parents (mothers and fathers) who consumed more fruits and vegetables had 5-year-old daughters who consumed more fruits and vegetables. Subjects lived in central Pennsylvania and were 99% non-Hispanic white. Neither girls nor parents met the recommended servings per day of fruits and vegetables, with the girls' mean intake of 3.1 ± 0.6 servings per day and the parents' mean intake of 0.9 ± 0.7 servings of fruit and 1.0 ± 0.6 servings of vegetables per day. Parental consumption of fruits and vegetables was significantly related to their daughters' fruit and vegetable consumption; however, no r value was given (Fisher and others 2002).

Gibson and others (1998) investigated fruit and vegetable consumption in 92 children (48 girls and 44 boys), aged 9 to 11 years, and their parents living in south London, England. The ethnicity of the mothers was 63% white, 16% Afrocaribbean, and 10% other. Mothers' diets were measured by a food frequency questionnaire, while children's diets were assessed by 3-day diaries. The mothers' socioeconomic and educational status, mothers' and children's nutritional knowledge, dietary beliefs and preferences, diet-disease attitudes, and mothers' habitual consumption, as well as mother-child correlations in knowledge, beliefs and behavior were examined and shown to have influence. Mothers who reported eating fruit most frequently tended ($r = 0.35$) to have children with high fruit consumption. Mothers' education was significantly and positively related ($r = 0.28$) to children's fruit intake. The mothers with the lowest education levels had children with the lowest fruit intakes. Mothers' preference for foods

with added sugars was positively correlated (r = 0.25) to children's intake of foods with added sugars (Gibson and others 1998).

Feunekes and others (1998) examined associations for selected foods between 309 mothers and 270 fathers and their 15-year-old adolescents (201 girls, 146 boys). Foods for which significant associations were demonstrated between father and children and mother and children included bacon, pizza, soup, butter/margarine added to cooked vegetables, fish fingers, and muesli (Feunekes and others 1998).

Research to date has shown that children's food and nutrient intakes are influenced to varying degrees by the dietary practices of their parents (caregivers), especially the mother. Studies, however, are very limited and are confined mostly to Caucasian populations with young children living mostly outside the United States, or if within the United States, living in an urban area.

Justification

Over the past two decades, there has been a rapid increase in the incidence of obesity in both adults and children in the United States. Obesity is a serious risk factor in both adults and children for the development of several conditions including cardiovascular disease, type 2 diabetes, and some forms of cancer. Research in predominantly Caucasian populations has shown that young children tend to have similar eating patterns and food choices as their parents. Research also has shown that overweight parents are likely to have overweight children. Obesity is more prevalent among African Americans, those of lower socioeconomic status and those living in rural areas, especially in the southern part of the United States. Yet, to date, there are no known studies that have examined relationships between dietary intakes of

parents/caregivers and children in this extremely high risk population, that is primarily low-income, African Americans living in rural areas of the south. Therefore, the purpose of this study was to examine relationships of dietary nutrient intakes and body mass index of primarily low-income, African American children and their female caregivers.

Research Hypotheses

1. There will be a significant relationship for dietary nutrient intakes between boys and their caregivers.
2. There will be a significant relationship for dietary nutrient intakes between girls and their caregivers.
3. There will be a significant relationship for food group intakes between boys and their caregivers.
4. There will be a significant relationship for food group intakes between girls and their caregivers.
5. There will be a significant relationship between the body mass index of boys and their caregivers.
6. There will be a significant relationship between the body mass index of girls and their caregivers.
7. There will be a significant correlation between boys' nutrient intakes and boys' body mass index.
8. There will be a significant correlation between girls' nutrient intakes and girls' body mass index.

CHAPTER III

RELATIONSHIPS BETWEEN DIETARY INTAKE AND BODY MASS INDEX OF PRIMARILY LOW-INCOME, AFRICAN AMERICAN CHILDREN AND THEIR FEMALE CAREGIVERS LIVING IN RURAL ALABAMA

ABSTRACT

The relationships between body mass index and dietary intake were examined in 110 primarily African American children and their caregivers from three rural counties (Bullock, Macon, and Wilcox) in Alabama. Children were 9 to 13 years of age and included 76 girls and 34 boys; 108 children were African American and two were Caucasian. Children attended schools in which over about 90% of the school children received free or reduced price lunch. Caregivers were female with an age range from 17 to 93 years. The prevalence of overweight among the children was 35.5% and when children at risk of overweight were included, the prevalence was 55.5%. The prevalence of obesity among the female caregivers was 53.5%. Significant positive correlations were found between caregivers and boys for intakes of energy, protein, fat, saturated fat, cholesterol, fiber, phosphorus, iron, magnesium, zinc, potassium, sodium, thiamin, riboflavin, niacin, folate, vitamin B6, and vitamin A. No significant correlations were found between caregivers and girls for any nutrient intakes. Significant correlations were found for intakes of fruit, vegetables, and meat between the caregivers and the boys. No correlations were found between caregivers and girls for any of the food groups. No

significant correlation was found between the caregivers' BMI and the boys' BMI. A significant positive correlation was found between the caregivers' BMI and the girls' BMI. No significant correlation was found between the boys' BMI and the boys' energy or macronutrient intakes. A significant correlation was found between the girls' BMI and the girls' intake of energy, protein, carbohydrate, fat, and fiber. These findings suggest that in this population group, caregivers influence, although only to a minor extent, the dietary intakes of fourth and fifth grade boys. The influence appears to be the greatest for intakes of protein, iron, and vitamin B6 and consumption of foods from the meat, fish, and poultry group.

INTRODUCTION

Obesity is considered an epidemic in the United States among both adults and children. The United States has the highest percentage of obesity in the world with approximately 65% of adult Americans classified as overweight or obese and 31% of children and adolescents aged 6 to 19 years overweight or at risk for overweight (Hedley and others 2004). Obesity can have adverse health effects including increased risk for cardiovascular disease, type 2 diabetes, certain cancers, and even death. Although obesity rates are problematic nationwide, the highest rates occur in the southeastern states. Alabama has the highest prevalence of obesity in the nation (CDC 2003a). There are also unequalities in obesity rates among racial groups with African Americans and Mexican Americans having a greater prevalence than whites. In addition, people of low socioeconomic status and of low education tend to have higher rates of obesity and overweight than those with greater socioeconomic status and education (ADPH 2003, CAS 2002, Mokdad and others 1999).

There are several causes of obesity and overweight. Decreased energy expenditure due to lifestyle, decreased physical activity, and more sedentary behavior without a decrease in energy intake ultimately leads to obesity. Furthermore, increased energy intake above energy needs causes obesity in children and adults and can be attributed to a number of factors. Marketing of energy dense foods and beverages, consumption of sugar-sweetened beverages, and increased consumption of fast-foods and foods from restaurants all contribute to increased energy intake in the United States. Among children, the increased obesity rates can also be attributed to parental influences. Parents influence the food choices, dietary practices, as well as nutrient intakes of their children (Birch and Fisher 1998, Feunekes and others 1998, Fisher and others 2002, Gibson and others 1998, Kremers and others 2002, Laskarzewski and others 1980, Oliveria and others 1992, Patterson and others 1988). This study examined relationships between dietary intake and body mass index of limited-income, African American elementary school-aged children and their female caregivers in rural Alabama.

SUBJECTS AND METHODS

Subjects

Children aged 9 to 13 years and adults were recruited for participation in the study from three rural counties (Bullock, Macon, and Wilcox) in Alabama. The recruited adults were the primary caregivers of the children and responsible for food preparation for the family. In Bullock County, 123 children from five classrooms in South Highland Elementary School were given information about the study. In Macon County, 330 children from three classrooms in D.C. Wolfe Elementary School, two classrooms in Notasulga Elementary School, one classroom in St. Joseph Catholic Elementary School,

five classrooms in Tuskegee Public Elementary School, and four classrooms in Washington Public Elementary School. In Wilcox County, 174 children from four classrooms in Hobbs Elementary School and four classrooms in Ervin Elementary School were given information about the study. The population densities of Bullock, Macon, and Wilcox counties were 17.7, 40.8, and 15.3 per square mile, respectively (Census 2000). The percentage of the population that was African American in these schools ranged from 86% to 100%. In these counties the percentage of the population receiving food stamps ranged from 22.5% to 36.3% and the percentage of the children living in poverty ranged from 39.4% to 50.7% (Alabama Kids Count 2003). Thus, many of the recruited children and caregivers were expected to be from limited-income families.

Oral announcements for recruitment purposes were made during 4-H and Alabama Cooperative Extension Nutrition Education Program meetings involving fourth and fifth grade children from each of the public schools in the designated counties. Participation was strictly voluntary. Informed consent from parents and informed assent from children were obtained prior to participation in the study. The study was approved by the Institutional Review Board for the Use of Human Subject in Research at Auburn University.

Anthropometric Assessment

The height and weight of each child were measured (Detecto Medical Scale with height rod, Webb City, MO) at the beginning (Sept.-Oct. 2002) and end (April-May 2003) of the school year using standard techniques. Only data from the second (Spring) assessment were used in this study. The height and weight of each parent were self-reported; this information was collected in the spring at the same time anthropometric

data were collected from the children. The height and weight of each participant were used to calculate the body mass index (BMI). Each child's BMI was categorized as underweight, normal, at risk of overweight, or overweight using gender specific BMI-for-age growth charts (CDC 2003b). Each caregiver's BMI was categorized as underweight, normal, overweight, obese, or extremely obese based on standard definitions (Ogden and others 2002).

Dietary Assessment

Dietary intakes of children were assessed from a food frequency questionnaire, the Kids' Food Questionnaire (Block Dietary Data Systems, Berkeley, CA). The Kids' Food Questionnaire, developed for children aged 8 to 13 years, assesses the frequency (times per day and week) of consumption of specified food items typically consumed by children and the portion size. The Kids' Food Questionnaire was administered twice, at the same time anthropometric data were collected. This study only examined data from the second (Spring) administration of the questionnaire. Each question of the questionnaire was read aloud by an investigator. Reference pictures of foods and beverages were provided to enable the children to report usual portion sizes consumed.

Dietary intakes of the adult participants were assessed in the spring using the self-administered Healthy Habits and History Questionnaire (HHHQ), which also provides information on the frequency of consumption and portion size of specified food items. Nutrient intakes were calculated from the Kids' Food Questionnaire and the HHHQ by Block Dietary Data Systems (Berkeley, CA). Children were told to have the primary care person in their household (e.g. the person who was responsible for food/meal preparation)

complete the HHHQ. This study was part of a larger study examining factors associated with childhood obesity.

Statistical Analysis

Statistical analysis was conducted using JMP (SAS Institute Inc., Cary, NC). Analysis of Variance (ANOVA) was used to determine statistical differences in age and BMI among children classified as underweight, normal weight, at risk of overweight, and overweight, and among adults classified as normal, overweight, obese, and extremely obese. Statistically significant findings using analysis of variance were followed with a Tukey Multiple Comparisons Test.

Pearson correlations were used to determine relationships between caregivers and children for BMI, nutrient intakes, and food group intakes. The relationships between child and caregiver for nutrient and food intakes which were examined included energy, protein, total fat, saturated fat, cholesterol, carbohydrate, fiber, calcium, phosphorus, iron, sodium, potassium, vitamin A, thiamin, riboflavin, niacin, vitamin C, folate, vitamin E, zinc, vitamin B6, magnesium, beta carotene, vitamin D, servings of milk, servings of bread, cereal, and pasta, servings of vegetables, servings of meat, fish, and poultry, servings of fats, and servings of fruits. Correlations also were run between children's BMI and children's energy, macronutrient, and fiber intakes and between the caregiver's BMI and the caregiver's energy, macronutrient, and fiber intakes. A p-value of < 0.05 was used to indicate statistical significance.

RESULTS

Children (n=135) aged 9 to 13 years and their caregivers from three rural Alabama counties (Bullock, Macon, and Wilcox) participated in the study.

Anthropometric data and food frequency questionnaires were obtained for the children and their primary caregiver. Data from 25 of the 135 caregivers, however, were excluded for the following reasons. Six food frequency questionnaires from caregivers were excluded because the caregivers were pregnant. Due to the small number of males, food frequency questionnaires of nine males and one subject in which the gender was unknown also were excluded. Other reasons for exclusion were daily energy consumption of less than 400 kcal (n = 6) or more than 6800 kcal (n = 3). Thus, the final sample consisted of 110 female caregivers and their children.

Income data were not collected from participants; however, information documenting the percentage of children at each of the schools receiving free or reduced price lunches was obtained. In Bullock County, 91% of students at South Highland Elementary School received free or reduced price lunches. In Macon County, the percentage of students at D.C. Wolfe, Notasulga, South Macon, Tuskegee Public, and Washington Public Elementary Schools who received free or reduced price lunches were 95%, 86%, 94%, 69%, and 93% respectively. Data for St. Joseph Catholic Elementary School are unknown. At both Ervin and Hobbs Elementary Schools in Wilcox County, 99% of students received free or reduced price lunches (GreatSchools.Net 2003).

Of the 110 children, there were 76 girls and 34 boys and 108 African American and 2 Caucasian. Children ranged in age from 9 to 13 years with five 9-year olds, 38 10-year olds, 58 11-year olds, seven 12-year olds, one 13-year old, and for two children age was not specified. A majority, 44 (40.7%), of the children were classified as normal based on BMI, 22 (20.4%) were at risk of overweight, and 39 (36.1%) overweight

(Table 1). As expected by design, the BMI differed significantly among children based on classification (Table 1).

The age range of the 110 female caregivers was 17 to 93 years, with a mean of 37.4 years. Caregivers were equally divided (27 each; 30.3%) in normal, overweight, and obese classifications; five (5.6%) adults were extremely obese (Table 2). No height and weight data were reported for 21 (19%) of the caregivers. Race information was not available for the caregivers.

The BMI of the children was significantly ($p = 0.011$) correlated ($r^2 = 0.073$, $r = 0.27$) with that of the caregivers. When children were separated by gender, the BMI of the female children was significantly ($p = 0.024$) correlated ($r^2 = 0.079$, $r = 0.281$) with the caregiver. No significant correlation was found between male children's BMI and caregiver's BMI.

Significant correlations were found between the children and caregivers for intakes of energy, protein, fat, saturated fat, cholesterol, fiber (Table 3). Significant correlations were found between the children and caregivers for several vitamins and minerals including thiamin, riboflavin, niacin, folate, vitamin B6, vitamin D, vitamin E (Table 4), phosphorus, magnesium, iron, sodium, and zinc (Table 5). When children were separated based on gender, boy's intakes of energy, protein, fat, saturated fat, cholesterol, fiber, phosphorus, iron, magnesium, zinc, potassium, sodium, thiamin, riboflavin, niacin, folate, vitamin B6, and vitamin A were significantly correlated with that of the caregiver (Table 3-5). Girl's intakes of nutrients were not found to correlate with those of the caregivers.

Children's BMI approached a significant ($p < 0.09$) correlation with the children's intakes of energy ($r^2 = 0.023$, $r = 0.152$), protein ($r^2 = 0.022$, $r = 0.148$), and carbohydrate ($r^2 = 0.021$, $r = 0.145$). The BMI of the girls was significantly correlated with the girls' intake of energy ($r^2 = 0.075$, $r = 0.274$), protein ($r^2 = 0.081$, $r = 0.285$), carbohydrate ($r^2 = 0.067$, $r = 0.259$), and fat ($r^2 = 0.061$, $r = 0.247$). A significant negative correlation was found between the girls' fiber intake and the girls' BMI ($r^2 = 0.073$, $r = -0.270$). The BMI of the boys did not correlate with the boy's macronutrient intakes. The BMI of the caregivers also did not correlate with caregivers' macronutrient intakes (data not shown).

Relationships of food group intakes between children and their primary caregivers are shown in Table 6. Servings of fats were significantly ($p = 0.046$) correlated ($r^2 = 0.036$, $r = 0.19$) between children and their caregivers. Servings of vegetables ($r^2 = 0.074$, $r = 0.272$) and meat ($r^2 = 0.059$, $r = 0.243$) between children and their caregivers also were significantly correlated. Among male children intakes of fruits were significantly correlated ($p = 0.0137$; $r^2 = 0.179$, $r = 0.423$) as were intakes of vegetables ($p = 0.044$; $r^2 = 0.120$, $r = 0.346$) and meats ($p = 0.006$; $r^2 = 0.210$, $r = 0.458$) with those of the female caregivers. No significant correlations were found between female children and their caregivers for food group intakes.

DISCUSSION

This study was the first to examine the relationships of body mass index and dietary intakes among primarily low-income, African American, elementary school aged children and their female caregivers. The findings of this study expand upon those reported in the literature by Feunekes and others (1998), Laskarzewski and others (1980), and Patterson and others (1998). In the present study, significant, but weak, correlations

were found for intakes of energy, protein, fat, saturated fat, cholesterol, fiber, phosphorus, magnesium, iron, sodium, zinc, thiamin, riboflavin, niacin, folate, vitamin B6, and vitamins D and E between the boys, but not the girls, and their female caregivers. Three other studies also have examined nutritional relationships for selected nutrients between parents and older children, but have not reported information on as many nutrients nor for a limited income, primarily African-American population. Patterson and others (1988) found significant correlations for intakes of energy, sodium, and fat between mothers and 5th and 6th grade children who were Anglo and Mexican American, but not between mothers and their older children. However, children were not separated by gender in the study. Feunekes and others (1998) demonstrated significant correlations for intakes of energy and fat (as a percentage of energy) between mothers and 15-year-old children from the Netherlands. Laskarzewski and others (1980) showed significant positive correlations between Caucasian and black parents and children age 6 to 19 years for energy, carbohydrate, saturated fat, and polyunsaturated fat intakes. When separated by race, significant correlations were found for intakes of energy, saturated fat, and carbohydrate between black mothers over age 40 years and their children. The correlations between the black parents (n = 60) and their children for nutrient (energy, carbohydrates, and saturated fat) intakes were higher than those between Caucasian parents (n = 234) and children. Similar to other published studies, children in the Laskarzweski study were grouped together and not separated by gender before comparisons were made with parents.

The present study also examined relationships in food group consumption. Significant but weak correlations for intakes of fats, vegetables, and meats between both

male and female children and their female caregivers were found. Significant correlations also were demonstrated between male children and caregivers for intakes of fruits, vegetables, and meats. No significant correlations between female children and their caregivers for food group intakes were demonstrated. Fisher and others (2002) also reported significant correlations for consumption of fruits and vegetables among Caucasian mothers and fathers and their 3 to 5 year-old daughters. Gibson and others (1998) also found significant correlations for fruit and sugar intakes between both male and female children, age 9 to 11 years, and their mothers living in London, England.

Reasons for the lack of significant correlations for nutrient intakes between the girls and their female caregivers versus the weak but significant correlations observed for nutrient intakes between the boys and their female caregivers are not clear. It is possible that the boys tend to eat whatever food has been prepared by the caregiver while the girls took the initiative to prepare other foods for their own consumption. Additional studies examining differences in food purchasing, preparation, and consumption habits between 9 to 13 year-old girls and boys may be helpful.

The prevalence of obesity among the children in the study population exceeded national findings with about 36.1% of the study children overweight versus national data of about 21% for African American children and adolescents (Hedley and others 2004). Of the female caregivers in the study, 66.3% were classified as overweight, obese, or extremely obese; these findings are slightly lower than national data on African American women, which ranges from about 70% to 82% depending on age (Hedley and others 2004). It is likely that the prevalence data for obesity in the adult females in this study are underestimated as height and weight data for the adults were self-reported and 19% of

the adults failed to provide any information. Self-reported anthropometric data are frequently underestimated (Kuczmarski and others 2001, Nawaz and others 2001).

In this study, the body mass index of the children was significantly correlated with the body mass index of caregivers; however, when separated by gender, only the body mass of the girls was significantly correlated with that of the caregivers. The relationship between the girls in this study and the caregivers is not known. The caregivers may have been genetically related or unrelated to the girls. Results from other studies examining body mass index relationships between parent and children vary. Feunekes and coworkers (1998), for example, found no significant correlation between the mother's and child's BMI; however, children were 15 years of age and included 201 girls and 146 boys. In contrast, Maffeis and others (1998) reported a significant correlation ($r = 0.37$) between the BMI of 112 Caucasian parents and the BMI of their children (58 boys and 54 girls) at age 12 years (Maffeis and others 1998). Reasons for the differences in findings between the present and other studies are not clear, but may be related to differences in environmental and genetic factors as well as age of the children.

Limitations to this study include the lack of information on the genetic relationships of the caregivers to the children and the lack of information on the sexual maturation or physical development of the children. In addition, the lack of knowledge on the accuracy of the self-reported height and weight measurements is a disadvantage to this study. Lastly, the lack of information on energy expenditure associated with physical activity is a limitation

In conclusion, the prevalence of overweight is higher than national findings in this population of African American children living in rural Alabama. The findings of this

study suggest that in this population group, caregivers influence, although only to a minor extent, the dietary intakes of fourth and fifth grade boys. The influence appears to be greatest for intakes of protein, iron, and vitamin B6 and consumption of foods from the meat, fish, and poultry group.

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Table 1. Mean (± SE) Body Mass Index (BMI) and Age of Children Classified as Normal, At Risk for Overweight, and Overweight*

BMI Classification		Children (n, (%))	BMI (kg/m^2)	Age (yr)
	Underweight	3 (2.8%)	14.0 ± 1.8^{a}	10.0 ± 0.4^{a}
	Normal	44 (40.7%)	17.6 ± 0.5^{a}	10.6 ± 0.1^{a}
	At Risk	22 (20.4%)	22.2 ± 0.7^{b}	10.6 ± 0.2^{a}
	Overweight	39 (36.1%)	29.8 ± 0.5^{c}	10.7 ± 0.1^{a}

[a,b,c] Different letters within a row indicate statistically significant ($p < 0.05$) difference
*BMI and age not available for 2 children

Table 2. Mean (± SE) Body Mass Index (BMI) and Age of Female Caregivers Classified as Normal, Overweight, Obese, and Extremely Obese*

BMI Classification		Caregiver (n, (%))	BMI (kg/m^2)	Age (yr)
	Underweight	3 (3.4%)	16.6 ± 1.4^{a}	37.5 ± 6.6^{a}
	Normal	27 (30.3%)	22.8 ± 0.5^{b}	38.0 ± 1.8^{a}
	Overweight	27 (30.3%)	27.9 ± 0.5^{c}	35.2 ± 1.9^{a}
	Obese	27 (30.3%)	34.3 ± 0.5^{d}	36.8 ± 1.8^{a}
	Extremely Obese	5 (5.6%)	48.9 ± 1.1^{e}	40.8 ± 4.2^{a}

[a,b,c,d,e] Different letters within a row indicate statistically significant ($p < 0.05$) difference
*BMI not available for 21 caregivers; age not available for 1 underweight and 2 overweight caregivers

Table 3. Relationships between Energy, Macronutrient, Cholesterol, and Fiber Intakes of Children and their Female Caregivers

Parameter (Caregiver vs. Child)	**Gender of Child**	**r^2**	**p-value**
Energy	male	0.126	0.039
	female	0.015	0.290
	all	0.039	0.039
Protein	male	0.254	0.002
	female	0.014	0.302
	all	0.063	0.008
Carbohydrates	male	0.044	0.233
	female	0.005	0.527
	all	0.013	0.231
Total Fat	male	0.119	0.046
	female	0.031	0.125
	all	0.054	0.015
Saturated Fat	male	0.124	0.042
	female	0.015	0.286
	all	0.057	0.006
Cholesterol	male	0.117	0.048
	female	0.0003	0.886
	all	0.045	0.014
Fiber	male	0.162	0.018
	female	0.002	0.697
	all	0.031	0.043

Table 4. Relationships between Vitamin Intakes of Children and their Female Caregivers

Parameter (Caregiver vs. Child)	**Gender of Child**	**r^2**	**p-value**
Thiamin	male	0.152	0.023
	female	0.020	0.218
	all	0.045	0.013
Riboflavin	male	0.227	0.004
	female	0.009	0.405
	all	0.044	0.014
Niacin	male	0.234	0.004
	female	0.041	0.080
	all	0.058	0.005
Folate	male	0.170	0.015
	female	0.0002	0.900
	all	0.031	0.040
Pyridoxine	male	0.284	0.001
	female	0.022	0.200
	all	0.056	0.006
Vitamin A	male	0.210	0.006
	female	0.009	0.406
	all	0.039	0.089
Vitamin D	male	0.068	0.137
	female	0.021	0.214
	all	0.030	0.044
Vitamin E	male	0.045	0.226
	female	0.029	0.141
	all	0.031	0.042
Beta Carotene	male	0.051	0.200
	female	0.076	0.016
	all	0.0007	0.769
Vitamin C	male	0.035	0.288
	female	0.001	0.829
	all	0.019	0.111

Table 5. Relationships between Mineral Intakes of Children and their Female Caregivers

Parameter (Caregiver vs. Child)	**Gender of Child**	**r^2**	**p-value**
Phosphorus	male	0.157	0.020
	female	0.007	0.458
	all	0.036	0.047
Magnesium	male	0.139	0.030
	female	0.010	0.380
	all	0.035	0.029
Iron	male	0.252	0.020
	female	0.048	0.056
	all	0.109	0.0004
Zinc	male	0.161	0.019
	female	0.018	0.242
	all	0.096	0.0003
Sodium	male	0.222	0.005
	female	0.037	0.097
	all	0.082	0.002
Potassium	male	0.131	0.035
	female	0.0003	0.880
	all	0.013	0.227
Calcium	male	0.080	0.106
	female	0.004	0.599
	all	0.015	0.210

Table 6. Relationships between Food Group Serving Intakes of Children and their Female Caregivers

Food Group (Caregiver vs. Child)	**Gender of child**	**r^2**	**p-value**
Fats	male	0.039	0.265
	female	0.037	0.096
	all	0.036	0.046
Vegetables	male	0.120	0.044
	female	0.027	0.158
	all	0.074	0.004
Fruits	male	0.179	0.013
	female	0.005	0.561
	all	0.001	0.692
Meat, Fish, Poultry	male	0.210	0.007
	female	0.014	0.303
	all	0.059	0.011
Milk and Dairy Products	male	0.011	0.549
	female	0.002	0.669
	all	0.004	0.489
Bread, Cereal, Pasta	male	0.053	0.191
	female	0.008	0.456
	all	0.022	0.122

CHAPTER IV

SUMMARY OF FINDINGS

Significant correlations were found between caregivers and boys for intakes of energy, protein, fat, saturated fat, cholesterol, fiber, phosphorus, iron, magnesium, zinc, potassium, sodium, thiamin, riboflavin, niacin, folate, vitamin B6, and vitamin A. Thus, these findings support research hypothesis one. No significant correlations were found between caregivers and girls for any nutrient intakes. These findings do not support the second research hypothesis.

Significant correlations were found for intakes of fruit, vegetables, and meat between the caregivers and the boys. These findings support the third research hypothesis. No correlations were found between caregivers and girls for any of the food groups. These findings do not support research hypothesis four.

No significant correlation was found between the caregivers' BMI and the boys' BMI. These findings do not support research hypothesis five. A significant positive correlation was found between the caregivers' BMI and the girls' BMI. These findings support research hypothesis six.

No significant correlation was found between the boys' BMI and the boys' energy or macronutrient intakes. These findings do not support research hypothesis seven. A significant correlation was found between the girls' BMI and the girls' intake of energy,

protein, carbohydrate, fat, and fiber. These findings support the eighth research hypothesis.

CHAPTER V

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CHAPTER VI

APPENDICES

APPENDIX A

APPROVED PARENTAL INFORMED CONSENT FORM BY THE AUBURN UNIVERSITY INSTITUTIONAL REVIEW BOARD FOR RESEARCH ON HUMANS

Auburn University
Auburn University, Alabama 36849-5605
College of Human Sciences

Department of Nutrition and Food Science
328 Spidle Hall

Telephone: (334) 844-3261
FAX: (334) 844-3268

Parental Informed Consent for Diet Quality in Rural Alabama Children

You and your child are invited to participate in a study of the diets of children and the individuals that prepares their food to be conducted by Jean Weese, Ph.D., Associate Professor and Janet Johnson, graduate student in the Department of Nutrition and Food Science. We hope to record the type of food that is eaten by people living in rural Alabama. You are your child were selected because your child participates in the 4-H program.

If you decide to participate, Jean Weese, Janet Johnson, and your county 4-H Leader will give your child a food frequency form and ask them to fill it out at school and one for you to fill out at home. This form asks how often you eat certain foods, like green beans, cornbread, or drinks such as colas and orange juice. After you and your child fill out the forms, this information will be sent to Auburn University to see what adults and children in rural Alabama eat. The form will take a few minutes to fill out.

Our goal is to learn what adults and children eat in Alabama. We will ask you to complete this form at the beginning and near the end of the school year. We will also ask your child to fill out a similar form at the beginning and near the end of the school year. Also we will ask your child out a form about their physical activity. For completing all the diet records and questionnaires, your child will be given a free pass for admission to the Montgomery Zoo in Montgomery, AL.

There are no risks to you or your child for participating in this research project. The information we gather will be kept completely confidential. We will assign a number to your child and to you to keep the information confidential. The information obtained in this research study will be used to develop nutrition education programs especially designed to meet the needs of children in the rural south. All information collected will be reported in a group format. For example, all the children in the south eat grits at least 4 times a week. No child will be singled out in the report but the information will go in as a group report.

Subject's initials

HUMAN SUBJECTS
OFFICE OF RESEARCH
PROJECT #01-071 MK0104
APPROVED 6/1/01 TO 6/1/03

Page 2: Parental Informed Consent for Diet Quality in Rural Alabama

If you or your child chooses to participate in this research project you can withdraw at anytime and you may withdraw any information that has been collected from you and your child. Your decision to participate or not, will not jeopardize you relationship with the Alabama Cooperative Extension System or Auburn University.

If you have any questions, we will be glad to answer them at anytime no or later. Contact either Jean Weese, Ph.D. at jweese@aces.edu or Janet Johnson at johns16@aces.edu or call (334) 844-4251. You may also ask any questions to you child's teacher or the 4-H leader. You will be provided a copy of this form to keep.

For information regarding your rights as a participant in this study you may contact the Office of Research Programs. Ms. Jeanna Sasser at (334) 844-5966 or sassejb@auburn.edu or Dr. Steve Shapiro at (334) 844-5499 or shapisk@auburn.edu

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU AND YOUR CHILD WILL PARTICIPATE IN THIS PROJECT. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

_____ I will participate in this study.

_____ _____
Parent's or Guardian's Signature Date

_____ I consent for my child to participate in this study.

_____ _____
Parent's or Guardian's Signature Date

_____ _____
Investigator's Signature Date

HUMAN SUBJECTS
OFFICE OF RESEARCH
PROJECT #01-071 MR 0106
APPROVED 6/15/01 TO 6/14/03

APPENDIX B

APPROVED PARTICIPANT INFORMED ASSENT FORM BY THE AUBURN UNIVERSITY INSTITUTIONAL REVIEW BOARD FOR RESEARCH ON HUMANS

Auburn University
Auburn University, Alabama 36849-5605
College of Human Sciences
Department of Nutrition and Food Science
328 Spidle Hall
Telephone: (334) 844-3261
FAX: (334) 844-3268

Child Assent for Diet Quality of Rural Alabama Children

Dear Student:

Our names are Jean Wesss and Janet Johnson. We work at Auburn Universtiy. We would like to ask your help in a study about what children eat in Alabama. We are asking you because you are in the 4-H program.

If you decide to help us, we will give you two forms to fill out. One will ask you how often you eat certain foods. The second form will be about your physical activity. Last we would like to weigh you and see how tall you are. For completing these forms we will give you a free pass for admission to the Montgomery Zoo.

We won't tell anybody else how you answered the questions. Sometimes, reports are written so that other people like us can learn from our study. If we do that no person will be singled out in a report. Our study may help others to develop nutrition education programs that are good for kids living in the South.

If you choose to help us out with this study you can change your mind and stop at any time. You also don't have to answer any questions that you don't want to.

If you have any questions, we will be glad to answer them at anytime. You may ask any questions to you child's teacher or the 4-H leader. You can also have them call us so we can answer your questions.

If you have had your questions answered and would like to help us in this study, please sign your name below.

_____ _____
Participant's Signature Date

_____ _____
Investigator's Signature Date

HUMAN SUBJECTS
OFFICE OF RESEARCH
PROJECT # 01-071 MR 0106
APPROVED 6/1/01 TO 6/1/03

APPENDIX C

KIDS' FOOD QUESTIONNAIRE

KIDS' FOOD QUESTIONNAIRE

Child's name ....

Today's Date ....

This survey is about all the food your child eats, either at home or at school or at a friend's house. Please fill it out together.
There are no right or wrong answers. It is very important that we learn what your child actually eats, not what he or she should eat.
The survey will take about 30 minutes.

- Use ONLY a number 2 pencil, NOT a pen
- Fill in the circles completely
- Erase completely if you make changes

Correct Mark ●

Incorrect Marks ✓ ✗

Child's Sex
○ Male ○ Female

Child's weight: ☐☐☐ Pounds

Child's Age ☐☐

Last week, was your child's diet typical of the way he or she usually eats?
○ Yes
○ No, he was sick
○ No, another reason

Child's height:
☐ Feet ☐☐ Inches

OFFICE USE ONLY

TODAY'S DATE			AGE	WEIGHT	HEIGHT
MO	DAY	YR		pounds	ft. in.

RESPONDENT ID NUMBER

1629

The next pages are about the foods your child eats. PLEASE READ THE DIRECTIONS on the back of the enclosed serving size pictures. Please ask your child about every food on the list.

Think about every time you ate anything in the past week. You can tell me you didn't eat a food at all in the past week, or that you ate it one day last week, two days last week, 3-4 days, 5-6 days, or every day.

	If YES, "How many days last week"					
		1 day	2 days	3-4 days	5-6 days	Every day	USUAL AMOUNT EATEN IN ONE DAY
Either at home or at school, did you eat any **Cold cereal, like Corn Flakes, Frosted Flakes or any other kind?**	YES ○ → How many days? NO ○	○	○	○	○	○	**See pictures.** Which bowl? ○ B ○ C ○ D
Last week, did you have **Milk on cereal?**	YES ○ → How many days? NO ○	○	○	○	○	○	
Did you eat any **Hot cereal, like oatmeal?**	YES ○ → How many days? NO ○	○	○	○	○	○	**See pictures.** Which bowl? ○ B ○ C ○ D
Last week, did you eat any **Eggs, including breakfast sandwiches with eggs?**	YES ○ → How many days? NO ○	○	○	○	○	○	How many eggs do you usually eat in 1 day? ○ Just a bite ○ 1 egg ○ 2 eggs ○ 3 eggs
Did you eat any **Bacon or sausage, including breakfast sandwiches with sausage?**	YES ○ → How many days? NO ○	○	○	○	○	○	
Did you eat any **Pancakes, waffles or French Toast?**	YES ○ → How many days? NO ○	○	○	○	○	○	How many? ○ ½ ○ 1 ○ 2 ○ 3
Either at home or at school, did you eat **Granola bars, breakfast bars, oatmeal raisin bars, or pop tarts?**	YES ○ → How many days? NO ○	○	○	○	○	○	How many? ○ ½ ○ 1 ○ 2 ○ 3
Last week, did you eat any **Cinnamon buns or muffins?**	YES ○ → How many days? NO ○	○	○	○	○	○	How many? ○ ½ ○ 1 ○ 2 ○ 3
With breakfast, did you drink any **Milk, chocolate milk or hot chocolate?** *(Don't include milk on cereal)*	YES ○ → How many days? NO ○	○	○	○	○	○	How many glasses or cartons for breakfast? ○ ½ ○ 1 ○ 2 ○ 3
At home or at school, did you drink any **Milk with lunch?**	YES ○ → How many days? NO ○	○	○	○	○	○	How many glasses or cartons for lunch? ○ ½ ○ 1 ○ 2 ○ 3
Last week, did you drink any **Milk with dinner or a snack?**	YES ○ → How many days? NO ○	○	○	○	○	○	How many glasses or cartons for dinner? ○ ½ ○ 1 ○ 2 ○ 3

Now tell me about the kind of **milk** you usually drink at home.

○ Whole milk ○ Reduced-fat (2%) milk ○ Low-fat (1%) milk
○ Non-fat milk ○ Lactaid milk ○ Rice milk ○ Soy milk ○ Don't know

[illegible]		If YES, "How many days last week"						USUAL AMOUNT EATEN IN ONE DAY				
			DAY	DAYS	DAYS	DAYS	DAY					
Last week, did you eat any **Bananas**?	YES ◯ → How many NO ◯	days? →	◯	◯	◯	◯	◯	How many do you usually have in 1 day?	◯ ½	◯ 1	◯ 2	◯ 3
Last week, did you eat any **Apples or pears**?	YES ◯ → How many NO ◯	days? →	◯	◯	◯	◯	◯	How many do you usually have in 1 day?	◯ ½	◯ 1	◯ 2	◯ 3
Did you eat any **Oranges or Tangerines**? (Don't count juices)	YES ◯ → How many NO ◯	days? →	◯	◯	◯	◯	◯	How many, in one day?	◯ ½	◯ 1	◯ 2	◯ 3
Did you eat any **Raisins, fruit roll-ups or dried fruit**?	YES ◯ → How many NO ◯	days? →	◯	◯	◯	◯	◯	**See pictures.** How much do you usually eat?	◯ A	◯ B	◯ C	◯ D
Did you eat any **Canned fruit like applesauce, fruit cocktail**?	YES ◯ → How many NO ◯	days? →	◯	◯	◯	◯	◯	**See pictures.** Which bowl?		◯ B	◯ C	◯ D
Did you eat any **Other fruit, like grapes, fresh peaches or melon**?	YES ◯ → How many NO ◯	days? →	◯	◯	◯	◯	◯	**See pictures.** How much do you usually eat?	◯ A	◯ B	◯ C	◯ D

[illegible]		If YES, "How many days last week"						USUAL AMOUNT EATEN IN ONE DAY				
			DAY	DAYS	DAYS	DAYS	DAY					
Last week, did you eat any **Hamburgers, cheeseburgers or meat loaf**?	YES ◯ → How many NO ◯	days? →	◯	◯	◯	◯	◯	How much?	◯ ½ small burger	◯ 1 small burger	◯ 1 large burger	◯ 2 large burgers
Did you have any **Tacos or burritos** with meat or chicken?	YES ◯ → How many NO ◯	days? →	◯	◯	◯	◯	◯	How many?	◯ ½	◯ 1	◯ 2	◯ 3
Did you eat any **Sandwiches with beef, like Hot Pockets, or meat ball subs**?	YES ◯ → How many NO ◯	days? →	◯	◯	◯	◯	◯					
Did you eat any **Beef steak, roast beef, or beef in frozen dinners**?	YES ◯ → How many NO ◯	days? →	◯	◯	◯	◯	◯	How much?	◯ A	◯ B	◯ C	◯ D

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Remember at home, at school, or from restaurant.	If YES,	"How many days last week" 1 DAY	2 DAYS	3-4 DAYS	5-6 DAYS	EVERY DAY	USUAL AMOUNT EATEN IN ONE DAY				
Last week, did you eat any **Pork chops or BBQ ribs?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	How much?	○ A	○ B	○ C	○ D
Did you eat any **Fried chicken or chicken nuggets?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	How many pieces?	○ 1	○ 2 (or 6 nuggets)	○ 3	○ 4
Did you eat **Any other kind of chicken,** like chicken and gravy, chicken salad, or in frozen dinners?	YES ○ → How many days? → / NO ○	○	○	○	○	○	How much?	○ A	○ B	○ C	○ D
Did you eat any **Fish, like fish sandwich, fish sticks,** or any kind of fish?	YES ○ → How many days? → / NO ○	○	○	○	○	○	How much?	○ A	○ B	○ C	○ D
Did you eat any dishes like **Beef & noodles, pot pie, Hamburger Helper, stew ...?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	How much?	○ A	○ B	○ C	○ D
Did you eat any **Spaghetti, ravioli or lasagna with tomato sauce?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	How much?	○ A	○ B	○ C	○ D
Did you eat any **Macaroni and cheese?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	How much?	○ A	○ B	○ C	○ D
Did you eat any **Pizza, or pizza pockets?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	How many slices?	○ ½	○ 1	○ 2	○ 3
Did you eat any **Hot dogs or corn dogs?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	How many hot dogs?	○ ½	○ 1	○ 2	○ 3
Did you eat any **Lunch meat like bologna or sliced ham,** either on sandwiches or by itself? *(Remember Lunchables)*	YES ○ → How many days? → / NO ○	○	○	○	○	○	How many slices of lunch meat?	○ ½	○ 1	○ 2	○ 3
Did you eat any **Refried beans or bean Burritos?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	How much?	○ A	○ B	○ C	○ D
Did you eat any **Vegetable soup, vegetable beef soup, or tomato soup?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	See pictures. Which bowl?		○ B	○ C	○ D
Did you eat any **Other soup like chicken noodle or cup-a-soup?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	See pictures. Which bowl?		○ B	○ C	○ D

PLEASE DO NOT WRITE IN THIS AREA

[illegible]	If YES,	"How many days last week" 1 DAY	2 DAYS	3-4 DAYS	5-6 DAYS	EVERY DAY	USUAL AMOUNT EATEN IN ONE DAY				
Last week, did you eat any **Hamburger buns, hotdog buns, or bagels** either alone or as a sandwich?	YES ○ → How many days? → / NO ○	○	○	○	○	○	How many did you have in one day?	○ ½	○ 1	○ 2	○ 3
Did you have any **Bread or toast**, including sandwiches?	YES ○ → How many days? → / NO ○	○	○	○	○	○	How many slices in 1 day?	○ 1	○ 2	○ 3-4	○ 5 or more
Did you have any **Tortillas** last week?	YES ○ → How many days? → / NO ○	○	○	○	○	○	How many ?	○ 1	○ 2	○ 3-4	○ 5 or more
Did you use any **Margarine or butter**, like on bread or on pancakes or on potatoes?	YES ○ → How many days? → / NO ○	○	○	○	○	○	How many times each day ?	○ 1	○ 2	○ 3	○ 4
Did you have any **Sliced cheese, Cheese Whiz, or grilled cheese sandwiches?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	How many slices of cheese?	○ ½	○ 1	○ 2	○ 3
Did you have a **Peanut butter sandwich?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	How many on those days?	○ ½	○ 1	○ 2	○ 3
Did you have any **Peanuts or other nuts or seeds?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	How much in one day?	○ A	○ B	○ C	○ D

Vegetables. Remember at home, at school, restaurant, or fast foods.	If YES,	"How many days last week" 1 DAY	2 DAYS	3-4 DAYS	5-6 DAYS	EVERY DAY	USUAL AMOUNT EATEN IN ONE DAY				
Last week, did you eat any **Green salad?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	**See pictures.** Which bowl?		○ B	○ C	○ D
If you had salad, did you have **Salad dressing** on it?	YES ○ / NO ○										
Did you have **Green beans, string beans?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	**See pictures.** How much?	○ A	○ B	○ C	○ D
Did you eat any **Baked beans, chili with beans, or any kind of beans?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	**See pictures.** How much?	○ A	○ B	○ C	○ D
Did you eat any **Corn** or **corn on the cob?**	YES ○ → How many days? → / NO ○	○	○	○	○	○	**See pictures.** How much?	○ A	○ B	○ C	○ D

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Remember at home, at school, or from a restaurant or fast food	If YES,	"How many days last week" 1 DAY	2 DAYS	3-4 DAYS	5-6 DAYS	EVERY DAY	USUAL AMOUNT EATEN IN ONE DAY				
Last week, did you eat any **Tomatoes?** *(Don't include tomato sauce)*	YES ○ → How many NO ○ days? →	○	○	○	○	○	How much?	○ A little	○ ½ tomato	○ 1	○ 2
Did you eat any **Greens, including spinach, mustard greens, or collards?**	YES ○ → How many NO ○ days? →	○	○	○	○	○	**See pictures.** How much?	○ A	○ B	○ C	○ D
Did you eat any **Broccoli?**	YES ○ → How many NO ○ days? →	○	○	○	○	○	**See pictures.** How much?	○ A	○ B	○ C	○ D
Did you eat any **Coleslaw or cabbage?**	YES ○ → How many NO ○ days? →	○	○	○	○	○	**See pictures.** How much?	○ A	○ B	○ C	○ D
Did you eat **Carrots**, either raw or cooked?	YES ○ → How many NO ○ days? →	○	○	○	○	○	**See pictures.** How much?	○ A	○ B	○ C	○ D
Did you eat any **Sweet potatoes, or sweet potato pie?**	YES ○ → How many NO ○ days? →	○	○	○	○	○	**See pictures.** How much?	○ A	○ B	○ C	○ D
Did you eat any **French fries, fried potatoes or Tater Tots?**	YES ○ → How many NO ○ days? →	○	○	○	○	○	**See pictures.** How much?	○ A	○ B (McD Small)	○ C (McD Large)	○ D
Did you have **any other kind of potatoes, like baked, boiled or mashed?**	YES ○ → How many NO ○ days? →	○	○	○	○	○	**See pictures.** How much?	○ A	○ B	○ C	○ D
Did you eat any **Other vegetable, like peas, squash, or peppers?**	YES ○ → How many NO ○ days? →	○	○	○	○	○	**See pictures.** How much?	○ A	○ B	○ C	○ D
Did you eat any **Rice?**	YES ○ → How many NO ○ days? →	○	○	○	○	○	**See pictures.** How much?	○ A	○ B	○ C	○ D
Did you have any **Gravy**, like on mashed potatoes or on rice?	YES ○ → How many NO ○ days? →	○	○	○	○	○					
Did you have any **Ketchup, salsa, or barbecue sauce?**	YES ○ → How many NO ○ days? →	○	○	○	○	○					

[illegible]	If YES,	"How many days last week"					USUAL AMOUNT EATEN IN ONE DAY				
		1 DAY	[illegible]	[illegible]	[illegible]	[illegible]					
Last week, did you have any **Potato chips, corn chips or popcorn?**	YES ○ → How many days? → NO ○	○	○	○	○	○	How much in the whole day?	○ A	○ B	○ C	○ D
Did you eat any **Crackers**, including snack crackers like Goldfish?	YES ○ → How many days? → NO ○	○	○	○	○	○	How much in the whole day?	○ A	○ B	○ C	○ D
Did you have any **Nachos with cheese?**	YES ○ → How many days? → NO ○	○	○	○	○	○	How much?	○ A	○ B	○ C	○ D
Did you have any **Ice cream, ice cream bars or frozen yogurt?**	YES ○ → How many days? → NO ○	○	○	○	○	○	See pictures. Which bowl?		○ B	○ C	○ D
Did you have any **Cookies?**	YES ○ → How many days? → NO ○	○	○	○	○	○	How many cookies?	○ 1	○ 2-3	○ 4-5	○ 6+
Did you have any **Doughnuts?**	YES ○ → How many days? → NO ○	○	○	○	○	○	How many doughnuts?	○ ½	○ 1	○ 2	○ 3
Did you have any **Cake, cupcakes, Tasty Cake, Ho-Ho's, Twinkies, etc.?**	YES ○ → How many days? → NO ○	○	○	○	○	○	How many pieces?	○ ½	○ 1	○ 2	○ 3
Did you have any **Pie or turnovers?**	YES ○ → How many days? → NO ○	○	○	○	○	○	How many pieces?	○ ½	○ 1	○ 2	○ 3
Did you have any **Pudding?**	YES ○ → How many days? → NO ○	○	○	○	○	○	How much?	○ A	○ B	○ C	○ D
Did you have any **Chocolate candy, like candy bars, Hugs, M&Ms?**	YES ○ → How many days? → NO ○	○	○	○	○	○	How many bars?	○ 1 small	○ 1 medium	○ 1 large	○ 2 large
Did you have any **Other candy, like Gummy bears, Starburst, Skittles?**	YES ○ → How many days? → NO ○	○	○	○	○	○	How many packages?	○ ¼	○ ½	○ 1	○ 2

Remember at home, at school

Question	If YES,	1 DAY	2 DAYS	3-4 DAYS	5-6 DAYS	EVERY DAY	USUAL AMOUNT IN ONE DAY				
Last week, did you drink any **Sodas like Coke, Sprite, etc.?** *(Don't count diet soda)*	YES ◯ → How many days? → NO ◯	◯	◯	◯	◯	◯	How many bottles or cans in 1 day?	◯ 1	◯ 2	◯ 3-4	◯ 5+
Did you drink any **Kool-Aid or Gatorade?**	YES ◯ → How many days? → NO ◯	◯	◯	◯	◯	◯	How many glasses in 1 day?	◯ 1	◯ 2	◯ 3	◯ 4
Did you drink any **Sunny Delight, Hi-C, Hawaiian Punch or Ocean Spray?**	YES ◯ → How many days? → NO ◯	◯	◯	◯	◯	◯	How many glasses or juice boxes?	◯ 1	◯ 2	◯ 3	◯ 4
Did you drink any **real orange juice?** *(Don't count orange sodas)*	YES ◯ → How many days? → NO ◯	◯	◯	◯	◯	◯	How many glasses or juice boxes?	◯ 1	◯ 2	◯ 3	◯ 4
Did you drink any **Other Real fruit juices** like apple juice or grape **juice?** *(Remember juice boxes)*	YES ◯ → How many days? → NO ◯	◯	◯	◯	◯	◯	How many?	◯ 1	◯ 2	◯ 3	◯ 4

In the past week, did you (the child) take any **vitamin pills**, like One-a-Day or Flintstones? ◯ No ◯ Yes **If yes, how many days last week?** ◯ 1-2 ◯ 3-4 ◯ 5-6 ◯ 7

For the Adult

Does your child participate in the School Lunch Program?

◯ No ◯ Yes, at full price ◯ Yes, at free or reduced price

Is your child (Check all that apply)

◯ African American ◯ Hispanic/Latino ◯ American Indian, Alaska native
◯ White ◯ Asian ◯ Other

What language do the parents usually speak at home?

◯ English ◯ Spanish ◯ Something else

What is the highest grade in school that any adult in the household finished?

◯ 1-8 ◯ 9-11 ◯ 12 (High School) ◯ Some College ◯ College Graduate

THANK YOU VERY MUCH FOR PARTICIPATING IN THIS IMPORTANT RESEARCH!

PLEASE DO NOT WRITE IN THIS AREA

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APPENDIX D

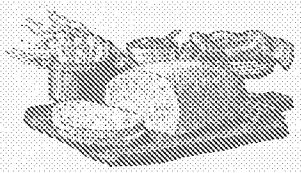
HEALTHY HABITS AND HISTORY QUESTIONNAIRE

RESPONDENT ID NUMBER

TODAY'S DATE

	DAY	YEAR
Jan		
Feb		
Mar		1998
Apr		1999
May		2000
Jun		2001
Jul		2002
Aug		2003
Sep		2004
Oct		2005
Nov		2006
Dec		2007

FOOD QUESTIONNAIRE



This form is about the foods you usually eat.
It will take about 30 - 40 minutes to complete.

- Please answer each question as best you can. Estimate if you aren't sure.
- Use only a No. 2 pencil.
- Fill in the circles completely, and erase completely if you make any changes.

Please print your name in this box.

SEX
- Male
- Female

If female, are you pregnant or breast feeding?
- No
- Yes
- Not female

AGE

WEIGHT pounds

HEIGHT ft. in.

First, a few general questions about what you eat.	AVERAGE USE IN THE PAST YEAR								
	LESS THAN ONCE per WEEK	1-2 per WEEK	3-4 per WEEK	5-6 per WEEK	1 per DAY	1 ½ per DAY	2 per DAY	3 per DAY	4+ per DAY
About how many servings of vegetables do you eat, per day or per week, not counting salad or potatoes?	○	○	○	○	○	○	○	○	○
About how many servings of fruit do you eat, not counting juices?	○	○	○	○	○	○	○	○	○
How often do you eat cold cereal?	○	○	○	○	○	○	○	○	○
How often do you use fat or oil in cooking?	○	○	○	○	○	○	○	○	○

What kinds of fat or oil do you usually use in cooking? MARK ONLY ONE OR TWO

- Don't know, or Pam
- Stick margarine
- Soft tub margarine
- Butter
- Butter/margarine blend
- Low-fat margarine
- Corn oil, vegetable oil
- Olive oil or canola oil
- Lard, fatback, bacon fat
- Crisco

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During the past year, have you taken any vitamins or minerals regularly, at least once a month?

○ No, not regularly ○ Yes, fairly regularly →

(IF YES) WHAT DID YOU TAKE FAIRLY REGULARLY?

VITAMIN TYPE	HOW OFTEN					FOR HOW MANY YEARS?					
	DIDN'T TAKE	A FEW DAYS per MONTH	1-3 DAYS per WEEK	4-6 DAYS per WEEK	EVERY DAY	LESS THAN 1 YR.	1 YEAR	2 YEARS	3-4 YEARS	5-9 YEARS	10+ YEARS
Multiple Vitamins. Did you take:											
Regular Once-A-Day, Centrum, or Thera type	○	○	○	○	○	○	○	○	○	○	○
Stress tabs or B-Complex type	○	○	○	○	○	○	○	○	○	○	○
Antioxidant combination type	○	○	○	○	○	○	○	○	○	○	○
Single Vitamins (not part of multiple vitamins)											
Vitamin A (not beta-carotene)	○	○	○	○	○	○	○	○	○	○	○
Beta-carotene	○	○	○	○	○	○	○	○	○	○	○
Vitamin C	○	○	○	○	○	○	○	○	○	○	○
Vitamin E	○	○	○	○	○	○	○	○	○	○	○
Folic acid, folate	○	○	○	○	○	○	○	○	○	○	○
Calcium, alone or combined with something else	○	○	○	○	○	○	○	○	○	○	○
Zinc, alone or combined with something else	○	○	○	○	○	○	○	○	○	○	○
Iron	○	○	○	○	○	○	○	○	○	○	○
Selenium	○	○	○	○	○	○	○	○	○	○	○

If you took Once-a-day, Centrum or Thera-type multiple vitamins, did you usually take types that ○ contain minerals, iron, zinc, etc. ○ do not contain minerals ○ don't know

If you took vitamin C or vitamin E:

How many milligrams of **vitamin C** did you usually take, on the days you took it?
○ 100 ○ 250 ○ 500 ○ 750 ○ 1000 ○ 1500 ○ 2000 ○ 3000+ ○ Don't know

How many IUs of **vitamin E** did you usually take, on the days you took it?
○ 100 ○ 200 ○ 300 ○ 400 ○ 600 ○ 800 ○ 1000 ○ 2000+ ○ Don't know

Did you take any of these supplements at least once a month?

○ Ginkgo ○ Ginseng ○ St. John's Wort ○ Kava Kava ○ Echinacea ○ Melatonin ○ DHEA
○ Glucosamine/Chondroitin ○ Something else ○ Didn't take these

---

The next section is about your usual eating habits in the past year or so. This includes all meals or snacks, at home or in a restaurant or carry-out. There are two kinds of questions to answer for each food:

HOW OFTEN, on average, did you eat the food during the past year?
*Please DO NOT SKIP any foods. Mark "Never" if you didn't eat it.

HOW MUCH did you usually eat of the food?

*Sometimes we ask how many you eat, such as 1 egg, 2 eggs, etc., ON THE DAYS YOU EAT IT.
*Sometimes we ask "how much" as A, B, C or D. LOOK AT THE ENCLOSED PICTURES. For each food, pick the picture (bowls or plates) that looks the most like the serving size you usually eat.
(If you don't have pictures: A=1/4 cup, B=1/2 cup, C=1 cup, D=2 cups.)
*Sometimes we made the "D" column a darker color. This is just to remind you to make sure you really eat that large a serving.

EXAMPLE: This person drank apple juice twice a week, and had one glass each time. Once a week he ate a "C" sized serving of rice (about 1 cup).

HOW OFTEN	NEVER	A FEW TIMES per YEAR	ONCE per MON.	2-3 TIMES per MON.	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D				
Apple juice	○	○	○	○	○	●	○	○	○	How many glasses each time	● 1	○ 2	○ 3	○ 4
Rice	○	○	○	○	●	○	○	○	○	How much each time	○ A	○ B	● C	○ D

HOW OFTEN	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME How many glasses on the days you drink it?
How often do you drink the following beverages?										
Tomato juice or V-8 juice	○	○	○	○	○	○	○	○	○	How many glasses each time ○ 1 ○ 2 ○ 3 ○ 4+
Real 100% orange juice or grapefruit juice, including fresh, frozen or bottled	○	○	○	○	○	○	○	○	○	How many glasses each time ○ 1 ○ 2 ○ 3 ○ 4+
Other real fruit juices like apple juice, prune juice, lemonade	○	○	○	○	○	○	○	○	○	How many glasses ○ 1 ○ 2 ○ 3 ○ 4+
Kool-Aid, Hi-C, or other drinks with added vitamin C	○	○	○	○	○	○	○	○	○	How many glasses ○ 1 ○ 2 ○ 3 ○ 4+
Drinks with some juice in them, like Sunny Delight, Juice Squeeze	○	○	○	○	○	○	○	○	○	How many bottles ○ 1 ○ 2 ○ 3 ○ 4+
Instant breakfast milkshakes like Carnation, diet shakes like SlimFast, or liquid supplements like Ensure	○	○	○	○	○	○	○	○	○	How many glasses or cans ○ 1 ○ 2 ○ 3 ○ 4+
Glasses of milk (any kind)	○	○	○	○	○	○	○	○	○	How many glasses ○ 1 ○ 2 ○ 3 ○ 4+

When you drink orange juice, how often do you drink a calcium-fortified brand?
○ Usually calcium-fortified ○ I don't know
○ Sometimes calcium-fortified ○ I don't drink orange juice
○ Hardly ever calcium-fortified

When you drink glasses of milk, what kind do you usually drink? **MARK ONLY ONE:**
○ Whole milk ○ Reduced-fat 2% milk ○ Low-fat 1% milk ○ Non-fat milk
○ Rice milk ○ Soy milk ○ I don't drink milk or soy milk

HOW OFTEN	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME
Regular soft drinks, or bottled drinks like Snapple (not diet drinks)	○	○	○	○	○	○	○	○	○	How many bottles or cans ○ 1 ○ 2 ○ 3-4 ○ 5+
Beer or non-alcoholic beer	○	○	○	○	○	○	○	○	○	How many bottles or cans ○ 1 ○ 2 ○ 3-4 ○ 5+
Wine or wine coolers	○	○	○	○	○	○	○	○	○	How many glasses ○ 1 ○ 2 ○ 3-4 ○ 5+
Liquor or mixed drinks	○	○	○	○	○	○	○	○	○	How many drinks ○ 1 ○ 2 ○ 3-4 ○ 5+
Glasses of water, tap or bottled	○	○	○	○	○	○	○	○	○	How many glasses ○ 1 ○ 2 ○ 3-4 ○ 5+
Coffee, regular or decaf	○	○	○	○	○	○	○	○	○	How many cups ○ 1 ○ 2 ○ 3-4 ○ 5+
Tea or iced tea (not herb teas)	○	○	○	○	○	○	○	○	○	How many cups ○ 1 ○ 2 ○ 3-4 ○ 5+

What kind? **MARK ONLY ONE:** ○ Regular beer ○ Light beer ○ Non-alcoholic beer ○ I don't drink beer

What do you usually add to coffee? **MARK ONLY ONE:** ○ Cream or half & half ○ Nondairy creamer ○ Milk ○ None of these

What do you usually add to tea? **MARK ONLY ONE:** ○ Cream or half & half ○ Nondairy creamer ○ Milk ○ None of these

Do you usually add sugar (or honey) to coffee? ○ No ○ Yes IF YES, how many teaspoons each cup? ○ 1 ○ 2 ○ 3+

Do you usually add sugar (or honey) to tea? ○ No ○ Yes IF YES, how many teaspoons each cup? ○ 1 ○ 2 ○ 3+

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HOW OFTEN	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME (SEE PORTION SIZE PICTURES FOR A-B-C-D)				
How often do you eat each of the following fruits, just during the 2-3 months when they are in season?														
Raw peaches, apricots, nectarines, while they are in season	○	○	○	○	○	○	○	○	○	How many each time	○ 1/2	○ 1	○ 2	○ 3
Cantaloupe, in season	○	○	○	○	○	○	○	○	○	How much	○ 1/8	○ 1/4	○ 1/2	○ 1
Strawberries, in season	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Watermelon, in season	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Any other fruit in season, like grapes, honeydew, pineapple, kiwi	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
How often do you eat the following foods all year round? Estimate your average for the whole year.														
Bananas	○	○	○	○	○	○	○	○	○	How many each time	○ 1/2	○ 1	○ 2	○ 3
Apples or pears	○	○	○	○	○	○	○	○	○	How many each time	○ 1/2	○ 1	○ 2	○ 3
Oranges or tangerines	○	○	○	○	○	○	○	○	○	How many each time	○ 1/2	○ 1	○ 2	○ 3
Grapefruit	○	○	○	○	○	○	○	○	○	How much	○ 1/2	○ 1	○ 2	○ 3
Canned fruit like applesauce, fruit cocktail, or dried fruit like raisins	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D

HOW OFTEN	NEVER	FEW/YEAR	ONCE/MONTH	2-3 TIMES/MONTH	ONCE/WEEK	TWICE/WEEK	3-4 TIMES/WEEK	5-6 TIMES/WEEK	EVERY DAY	HOW MUCH EACH TIME				
Eggs, including egg biscuits or Egg McMuffins (Not egg substitutes)	○	○	○	○	○	○	○	○	○	How many eggs each time	○ 1	○ 2	○ 3	○ 4
Bacon	○	○	○	○	○	○	○	○	○	How many pieces	○ 1	○ 2	○ 3	○ 4
Breakfast sausage, including sausage biscuits	○	○	○	○	○	○	○	○	○	How many pieces	○ 1	○ 2	○ 3	○ 4
Pancakes, waffles, French toast, Pop Tarts	○	○	○	○	○	○	○	○	○	How many pieces	○ 1	○ 2	○ 3	○ 4
Breakfast bars, granola bars, Power bars	○	○	○	○	○	○	○	○	○	How many	○ 1	○ 2	○ 3	○ 4
Cooked cereals like oatmeal, cream of wheat or grits	○	○	○	○	○	○	○	○	○	Which bowl		○ B	○ C	○ D
High-fiber cereals like All Bran, Raisin Bran, Fruit-n-Fiber	○	○	○	○	○	○	○	○	○	Which bowl		○ B	○ C	○ D

Which high-fiber cereal do you eat most often? **MARK ONLY ONE:** ○ All Bran or Bran Buds ○ Raisin Bran ○ Fiber One, Fruit-n-Fiber, etc. ○ Something else ○ I don't know ○ I don't eat it

Product 19, Just Right or Total cereal	○	○	○	○	○	○	○	○	○	Which bowl		○ B	○ C	○ D
Any other cold cereal, like Corn Flakes, Cheerios, Special K	○	○	○	○	○	○	○	○	○	Which bowl		○ B	○ C	○ D
Milk or milk substitutes on cereal	○	○	○	○	○	○	○	○	○	How many oz. on cereal	○ 3 oz.	○ 4-5 oz.	○ 6-7 oz.	○ 8+ oz.
Yogurt or frozen yogurt	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Cheese, sliced cheese or cheese spread, including on sandwiches	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4

When you eat cheese, is it ○ Usually low-fat ○ Sometimes low-fat ○ Hardly ever low-fat ○ Don't know/don't eat

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HOW OFTEN	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D
How often do you eat the following vegetables, including fresh, frozen, canned or in stir-fry, at home or in a restaurant?										
Broccoli	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Carrots, or mixed vegetables or stews containing carrots	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Corn	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Green beans or green peas	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Spinach	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Mustard greens, turnip greens, collards	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
French fries, fried potatoes or hash browns	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
White potatoes not fried, incl. boiled, baked, mashed & potato salad	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Sweet potatoes, yams (Not in pie)	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Cole slaw, cabbage	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Green salad	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Raw tomatoes, including in salad	○	○	○	○	○	○	○	○	○	How much ○1/4 ○1/2 ○1 ○2
Salad dressing	○	○	○	○	○	○	○	○	○	How many Tbsp. ○1 ○2 ○3 ○4

Is your salad dressing ○ Usually low-fat ○ Sometimes low-fat ○ Hardly ever low-fat ○ Don't know/don't use

HOW OFTEN	NEVER	FEW/YEAR	ONCE/MONTH	2-3 TIMES/MONTH	ONCE/WEEK	2 TIMES/WEEK	3-4 TIMES/WEEK	5-6 TIMES/WEEK	EVERY DAY	HOW MUCH EACH TIME
Any other vegetable, like okra, squash, cooked green peppers	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Refried beans or bean burritos	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Chili with beans (with or without meat)	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Baked beans, black-eye peas, pintos, any other dried beans	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Vegetable stew	○	○	○	○	○	○	○	○	○	Which Bowl ○B ○C ○D
Vegetable soup, vegetable beef, chicken vegetable, or tomato soup	○	○	○	○	○	○	○	○	○	Which Bowl ○B ○C ○D
Split pea, bean or lentil soup	○	○	○	○	○	○	○	○	○	Which Bowl ○B ○C ○D
Any other soup, like chicken noodle, chowder, mushroom, instant soups	○	○	○	○	○	○	○	○	○	Which Bowl ○B ○C ○D
Spaghetti, lasagna or other pasta with tomato sauce	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Cheese dishes without tomato sauce, like macaroni and cheese	○	○	○	○	○	○	○	○	○	How much ○A ○B ○C ○D
Pizza, including carry-out	○	○	○	○	○	○	○	○	○	How many slices ○1 ○2 ○3 ○4

HOW OFTEN	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME — SEE PORTION SIZE PICTURES FOR A-B-C-D
Do you ever eat chicken, meat or fish? ○ Yes ○ No **IF NO, SKIP TO NEXT PAGE**										
Hamburgers, cheeseburgers, meat loaf, at home or in a restaurant	○	○	○	○	○	○	○	○	○	How much meat: ○ A 1/8 lb. ○ B 1/4 lb. ○ C 1/2 lb. ○ D 3/4 lb.
Tacos, burritos, enchiladas, tamales, etc. with meat or chicken	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Beef steaks, roasts, pot roast, or in frozen dinners or sandwiches	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
How do you like beef cooked? ○ Rare ○ Medium ○ Well done ○ I don't eat beef										
Pork chops, pork roasts, or dinner ham	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
When you eat meat, do you ○ Avoid eating the fat ○ Sometimes eat the fat ○ Often eat the fat ○ I don't eat meat										
Veal, lamb or deer meat	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Ribs, spareribs	○	○	○	○	○	○	○	○	○	How many ribs: ○ 3-4 ○ 5-6 ○ 7-8 ○ 9+
Liver, including chicken livers or liverwurst	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Gizzard, pork neckbones, chitlins, pigs feet, etc.	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Mixed dishes with beef or pork, like stew, corned beef hash, stuffed cabbage, meat dish with noodles	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Mixed dishes with chicken, like chicken casserole, chicken & noodles, pot pie or in stir-fry	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Fried chicken, at home or in a restaurant	○	○	○	○	○	○	○	○	○	# medium pieces: ○ 1 ○ 2 ○ 3 ○ 4+
Chicken or turkey not fried, such as baked, grilled, or on sandwiches	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
When you eat chicken, do you ○ Avoid eating the skin ○ Sometimes eat the skin ○ Often eat the skin										

HOW OFTEN	NEVER	FEW YEAR	ONCE MONTH	2-3 TIMES MONTH	ONCE WEEK	2 TIMES WEEK	3-4 TIMES WEEK	5-6 TIMES WEEK	EVERY DAY	HOW MUCH EACH TIME
Oysters	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Other shellfish like shrimp, scallops, crabs	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Tuna, tuna salad, tuna casserole	○	○	○	○	○	○	○	○	○	How much of the tuna: ○ A ○ B ○ C ○ D
Fried fish or fish sandwich, at home or in a restaurant	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Other fish, not fried	○	○	○	○	○	○	○	○	○	How much: ○ A ○ B ○ C ○ D
Hot dogs, or sausage like Polish, Italian or chorizos	○	○	○	○	○	○	○	○	○	How many: ○ 1 ○ 2 ○ 3 ○ 4
Are your hot dogs ○ Usually low-fat ○ Sometimes low-fat ○ Hardly ever low-fat ○ Don't know/don't eat them										
Bologney, sliced ham, turkey lunch meat, other lunch meat	○	○	○	○	○	○	○	○	○	How many slices: ○ 1 ○ 2 ○ 3 ○ 4
Are your lunch meats ○ Usually low-fat or turkey ○ Sometimes low-fat ○ Hardly ever low-fat										

HOW OFTEN	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D				
Noodles, macaroni, pasta salad	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Tofu, bean curd	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Meat substitutes, such as veggie burgers, Gardenburgers	○	○	○	○	○	○	○	○	○	How many patties	○ 1	○ 2	○ 3	○ 4
Chinese food, Thai or other Asian food, not counted above	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Snacks like potato chips, corn chips, popcorn (not pretzels)	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D

Are these snacks ○ Usually low-fat ○ Sometimes low-fat ○ Hardly ever low-fat ○ Don't know/don't eat

HOW OFTEN	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME				
Peanuts, other nuts or seeds	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Crackers	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Doughnuts, Danish pastry	○	○	○	○	○	○	○	○	○	How many	○ 1	○ 2	○ 3	○ 4
Cake, sweet rolls, coffee cake	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D

Are they ○ Usually low-fat ○ Sometimes low-fat ○ Hardly ever low-fat ○ Don't know/don't eat

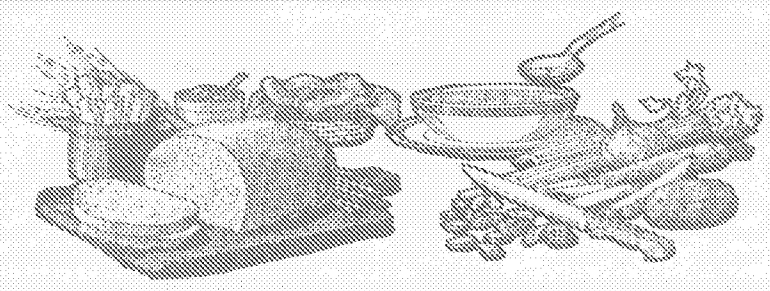
Cookies	○	○	○	○	○	○	○	○	○	How many	○ 1-2	○ 3-5	○ 6-7	○ 8+

Are your cookies ○ Usually low-fat ○ Sometimes low-fat ○ Hardly ever low-fat ○ I don't know/don't eat

Ice cream, ice milk, ice cream bars	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D

Is your ice cream ○ Usually low-fat ○ Sometimes low-fat ○ Hardly ever low-fat ○ I don't know/don't eat

Pumpkin pie, sweet potato pie	○	○	○	○	○	○	○	○	○	How many slices	○ 1/8	○ 1/4	○ 1/2	○ 3/4
Any other pie or cobbler	○	○	○	○	○	○	○	○	○	How many slices	○ 1/2	○ 1	○ 2	○ 3
Chocolate candy, candy bars	○	○	○	○	○	○	○	○	○	How many bars	○ small	○ medium	○ large	○ extra large
Other candy, not chocolate, like hard candy, caramel, jelly beans	○	○	○	○	○	○	○	○	○	How many pieces	○ 1-2	○ 3-5	○ 6-7	○ 8+



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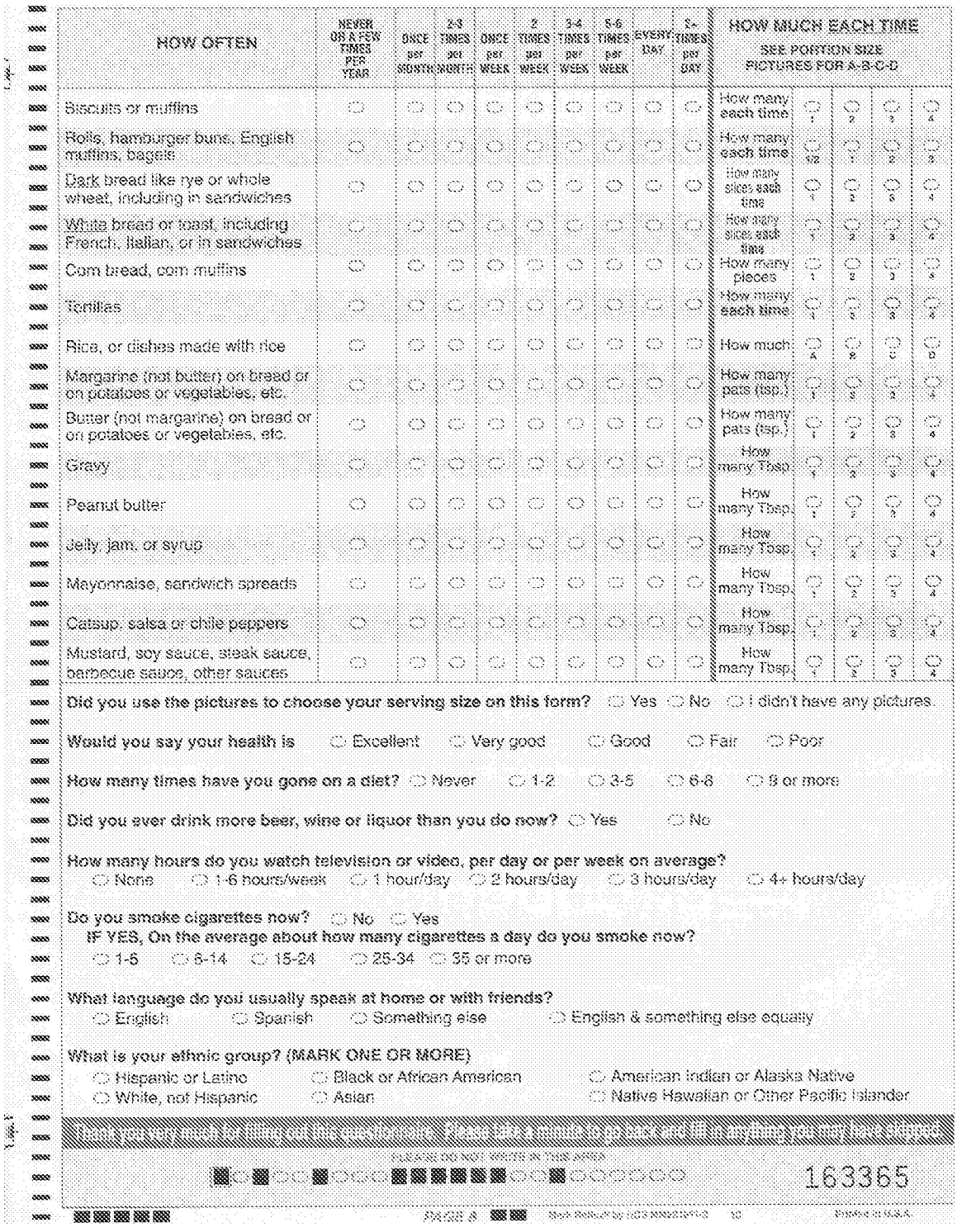

HOW OFTEN	NEVER OR A FEW TIMES PER YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	2 TIMES per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	2+ TIMES per DAY	HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D				
Biscuits or muffins	○	○	○	○	○	○	○	○	○	How many each time	○ 1	○ 2	○ 3	○ 4
Rolls, hamburger buns, English muffins, bagels	○	○	○	○	○	○	○	○	○	How many each time	○ 1/2	○ 1	○ 2	○ 3
Dark bread like rye or whole wheat, including in sandwiches	○	○	○	○	○	○	○	○	○	How many slices each time	○ 1	○ 2	○ 3	○ 4
White bread or toast, including French, Italian, or in sandwiches	○	○	○	○	○	○	○	○	○	How many slices each time	○ 1	○ 2	○ 3	○ 4
Corn bread, corn muffins	○	○	○	○	○	○	○	○	○	How many pieces	○ 1	○ 2	○ 3	○ 4
Tortillas	○	○	○	○	○	○	○	○	○	How many each time	○ 1	○ 2	○ 3	○ 4
Rice, or dishes made with rice	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Margarine (not butter) on bread or on potatoes or vegetables, etc.	○	○	○	○	○	○	○	○	○	How many pats (tsp.)	○ 1	○ 2	○ 3	○ 4
Butter (not margarine) on bread or on potatoes or vegetables, etc.	○	○	○	○	○	○	○	○	○	How many pats (tsp.)	○ 1	○ 2	○ 3	○ 4
Gravy	○	○	○	○	○	○	○	○	○	How many Tbsp	○ 1	○ 2	○ 3	○ 4
Peanut butter	○	○	○	○	○	○	○	○	○	How many Tbsp	○ 1	○ 2	○ 3	○ 4
Jelly, jam, or syrup	○	○	○	○	○	○	○	○	○	How many Tbsp	○ 1	○ 2	○ 3	○ 4
Mayonnaise, sandwich spreads	○	○	○	○	○	○	○	○	○	How many Tbsp	○ 1	○ 2	○ 3	○ 4
Catsup, salsa or chile peppers	○	○	○	○	○	○	○	○	○	How many Tbsp	○ 1	○ 2	○ 3	○ 4
Mustard, soy sauce, steak sauce, barbecue sauce, other sauces	○	○	○	○	○	○	○	○	○	How many Tbsp	○ 1	○ 2	○ 3	○ 4

Did you use the pictures to choose your serving size on this form? ○ Yes ○ No ○ I didn't have any pictures

Would you say your health is ○ Excellent ○ Very good ○ Good ○ Fair ○ Poor

How many times have you gone on a diet? ○ Never ○ 1-2 ○ 3-5 ○ 6-8 ○ 9 or more

Did you ever drink more beer, wine or liquor than you do now? ○ Yes ○ No

How many hours do you watch television or video, per day or per week on average?
○ None ○ 1-6 hours/week ○ 1 hour/day ○ 2 hours/day ○ 3 hours/day ○ 4+ hours/day

Do you smoke cigarettes now? ○ No ○ Yes
IF YES, On the average about how many cigarettes a day do you smoke now?
○ 1-5 ○ 6-14 ○ 15-24 ○ 25-34 ○ 35 or more

What language do you usually speak at home or with friends?
○ English ○ Spanish ○ Something else ○ English & something else equally

What is your ethnic group? (MARK ONE OR MORE)
○ Hispanic or Latino ○ Black or African American ○ American Indian or Alaska Native
○ White, not Hispanic ○ Asian ○ Native Hawaiian or Other Pacific Islander

Thank you very much for filling out the questionnaire. Please use a pencil to go back and fill in anything you may have skipped.

PLEASE DO NOT WRITE IN THIS AREA

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APPENDIX E

SUPPLEMENATARY TABLES

Table 1E. Relationships between Macronutrient, Cholesterol, and Fiber Intakes per 100 Kcal of Children and their Female Caregivers

Parameter (Caregiver vs. Child)	**Gender of child**	**r^2**	**p-value**
Protein	all	0.001	0.780
	male	0.011	0.548
	female	0.00006	0.946
Total Fat	all	0.001	0.732
	male	0.001	0.086
	female	0.001	0.778
Saturated Fat	all	0.001	0.722
	male	0.003	0.777
	female	0.00003	0.964
Cholesterol	all	0.010	0.309
	male	0.046	0.222
	female	0.00003	0.964
Carbohydrates	all	0.001	0.697
	male	0.0004	0.909
	female	0.003	0.650
Fiber	all	0.006	0.410
	male	0.005	0.679
	female	0.007	0.475

Table 2E. Relationships between Vitamin Intakes per 100 Kcal of Children and their Female Caregivers

Parameter (Caregiver vs. Child)	**Gender of child**	**r^2**	**p-value**
Vitamin A IU	all	0.018	0.162
	male	0.072	0.125
	female	0.006	0.503
Vitamin A RE	all	0.012	0.260
	male	0.083	0.099
	female	0.0004	0.859
Vitamin B1	all	0.012	0.259
	male	0.049	0.207
	female	0.002	0.674
Vitamin B2	all	0.015	0.199
	male	0.042	0.247
	female	0.008	0.441
Niacin	all	0.027	0.088
	male	0.269	0.002
	female	0.0005	0.854
Vitamin C	all	0.050	0.018
	male	0.182	0.012
	female	0.004	0.571
Folate	all	0.005	0.450
	male	0.010	0.565
	female	0.002	0.726
Vitamin E	all	0.003	0.547
	male	0.023	0.394
	female	0.00003	0.963
Vitamin B6	all	0.015	0.202
	male	0.068	0.135
	female	0.0002	0.907
Vitamin D	all	0.00009	0.921
	male	0.001	0.866
	female	0.000007	0.982

Table 3E. Relationships between Mineral Intakes per 100 Kcal of Children and their Female Caregivers

Parameter (Caregiver vs. Child)	**Gender of child**	**r^2**	**p-value**
Calcium	all	0.013	0.245
	male	0.095	0.075
	female	0.002	0.696
Phosphorus	all	0.004	0.520
	male	0.032	0.031
	female	0.00006	0.948
Iron	all	0.078	0.003
	male	0.245	0.003
	female	0.040	0.085
Sodium	all	0.013	0.236
	male	0.012	0.054
	female	0.014	0.316
Potassium	all	0.0004	0.833
	male	0.007	0.629
	female	0.001	0.808
Zinc	all	0.024	0.106
	male	0.039	0.262
	female	0.005	0.550
Magnesium	all	0.0002	0.875
	male	0.001	0.832
	female	0.004	0.982