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## KENTUCKY WIC PARTICIPANTS' KNOWLEDGE, ATTITUDES, AND BELIEFS REGARDING GRAINS

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KENTUCKY WIC PARTICIPANTS'  
KNOWLEDGE, ATTITUDES, AND BELIEFS REGARDING GRAINS

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THESIS

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A thesis submitted in partial fulfillment of the  
requirements for the degree of Master of Sciences  
College of Agriculture  
at the University of Kentucky

By

Dustin Tyler Reed

Lexington, KY

Director: Kwaku Addo, Ph.D, Associate Professor

Lexington, Kentucky

2012

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## ABSTRACT OF THESIS

### KENTUCKY WIC PARTICIPANTS' KNOWLEDGE, ATTITUDES, AND BELIEFS REGARDING GRAINS

Obesity, diabetes, cardiovascular disease, and poor dietary habits are major healthcare problems in the United States. These issues are especially prevalent in the state of Kentucky and among at-risk populations such as Women, Infants, and Children (WIC) participants. Studies have found that whole grains play a role in weight maintenance, protection against type 2 diabetes, and lowering cholesterol. Interventions aimed at improving WIC participant dietary behavior and intake has been successful as well. This study assessed Kentucky WIC participants' knowledge of the benefits of consuming grains, attitudes and beliefs regarding food purchasing and grains, and identified grains consumed in a two-week period. A survey, created with the input of Registered Dietitians and WIC staff, examined these factors. Results from the survey found that WIC participants might benefit from education on: purchasing nutrient-dense foods (especially whole grains), the nutrition facts panel, types of grains, nutrients such as calories, fat, sugar, and fiber, serving sizes, and how to get children to eat whole grains.

KEY WORDS: WIC, whole grains, nutrition, Kentucky, attitudes and beliefs

Dustin Tyler Reed

May 1, 2012

KENTUCKY WIC PARTICIPANTS'  
KNOWLEDGE, ATTITUDES, AND BELIEFS REGARDING GRAINS

By

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Date

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## **Chapter 1: Introduction**

Obesity, diabetes, and cardiovascular disease (CVD) have become an alarming health concern in the United States [1]. Nearly two-thirds of all adults are overweight or obese and childhood obesity has tripled within the past thirty years [2]. Because of the rise in overweight and obesity, the prevalence of diabetes has also increased, with CVD being the leading cause of morbidity and mortality [3, 4, 5]. The cost of these disease states is staggering. Chronic diseases account for over one trillion dollars spent on health care annually and are among the leading causes of death in the United States [6, 7].

Over the past thirty years, there has been a marked increase in calorically dense food and beverage intake and decrease in physical activity among children and adults [8]. Not surprisingly, the rising prevalence of obesity and co-morbidities have been linked to increased consumption of high calorie food and drinks, and decreased physical activity. These changes in behavior can be correlated to changes in the food market, built environment, school system, and family structure. These changes have affected family behavior in that more families are eating away from the home more often, consuming larger portions, using a vehicle more, have both parents employed, or have households with one parent.

Research has shown that a diet that regularly includes whole grains can lower the risk of chronic disease and co-morbidities including obesity, diabetes, and cardiovascular disease. The National Health and Nutrition Examination Survey (NHANES) 1999-2002 found that only 8% of adults consumed three or more servings of whole grains per day [9].

Whole grains are beneficial is because all three parts of the grain, bran, germ, and endosperm remain intact during processing [10]. During refining, the bran and germ is removed from the grain, removing dietary fiber, iron, and B vitamins. Each part of the grain contains nutrients that are essential to a healthy diet such as fiber, protein, vitamins and minerals [10, 11].

In recent years, the consumer's awareness of grain foods, especially whole grain foods, has increased. However, in spite of efforts such as the Whole Grain Council creating the Whole Grain Stamp for package labeling, there still is a lack of understanding and consumption among adolescents and adults [9, 12]. Research from Marquart *et al*, 2006 developed a questionnaire that assessed beliefs about whole grain foods. Survey respondents included nutrition professionals, health club members, and Women, Infants, and Children (WIC) participants. The majority of survey respondents reported awareness of the term whole grain, almost all among food and nutrition professionals and health club members, but awareness was lowest among WIC participants. WIC participants also named fiber as a benefit from consuming whole grains less explicitly than other participants and provided fewer and less detailed answers.

The WIC participants in the Marquart study and all other WIC participants receive supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, non-breastfeeding postpartum women, and infants and children up to age five who are at nutritional risk [13]. Whole grains included on the WIC food package include breakfast cereal, infant cereal, bread, rolls, rice, and tortillas [14]. One-half of the total number of cereals on a state agency's food list must have whole grain as the primary ingredient by weight. Whole grain must also be the primary ingredient by

weight in all whole grain bread, buns, and rolls. WIC agencies at the state level are obligated to meet federal regulatory requirements when authorizing foods on the state WIC food list, but do not have to authorize all foods that meet the regulatory requirements. For instance, WIC participants in Arkansas can purchase bread with cinnamon and raisins with WIC vouchers, but this type of bread is unavailable for purchase with WIC vouchers in Kentucky [15, 16].

Why is it important to examine food intake, attitudes, and beliefs of WIC participants at the state level? Not only can each state potentially have a different WIC supplemental food list, but also each state has a unique population with its own set of cultural preferences regarding food and attitudes toward health. In addition, certain regions of the country suffer from epidemics at a higher rate than other regions. For instance, obesity is more prevalent in the South and Midwest United States as opposed to the Western and Northwestern United States and diabetes is more prevalent in the South and Southwest United States than the Midwest and West United States [17, 18].

This study analyzes Kentucky WIC participants' responses to questions about grains and whole grains. Participants were recruited from WIC clinics and health departments in Barren, Bath, Daviess, Fayette, Rowan, Warren, and Wolfe counties, representing Western, Central, and Eastern Kentucky. The results of this study will provide better insight into WIC participants' attitude and behaviors regarding food purchasing and grains, knowledge of benefits of consuming grains, types of grains consumed, and hopefully guide nutrition education programming for WIC clients.

## **Chapter 2: Literature Review**

### *Grains-Definition*

Wheat, rice, oats, maize, rye, barley, and sorghum are examples of cereal grains. Grain products are divided into two subgroups, whole grains and refined grains. Whole grains are unrefined and contain the bran, germ, and endosperm. Refined grains go through a mechanical process that removes the bran and germ from the grain leaving the least nutrient dense part, the endosperm [10]. Most refined grains go through an enrichment process to restore nutrients; however, fiber, protein, and several vitamins and minerals may not be restored [19].

### *History of Grains*

Cereal grains consumed today were derived from their wild precursors and domesticated several thousand years ago [20]. Wheat and barley were the first grains to be domesticated approximately ten thousand years ago in the area known as the Middle East. Oats were domesticated in Europe as recently as three thousand years ago [21]. Consumption of grains is a relatively new practice in the history of humanity because of seed size, harvesting, and processing would have been impossible for pre-behaviorally modern humans to utilize as a food source [22]. One of the most remarkable incidences in recent history involving grains happened during the early part of the twentieth century in the United States and is called the “Dust Bowl” [23, 24]. The “Dust Bowl” was a result of poor farming practices that resulted in soil erosion. Soil erosion and unanticipated droughts, caused large-scale crop failures that left fields without vegetation and barren,

exposing the soil to the wind. This was the source of the major dust storms and atmospheric dust loading that was responsible for the “Dust Bowl”.

#### *Diseases in the United States*

The United States is facing an obesity epidemic that is not only prevalent among adults, but increasingly among children. According to a study conducted by the United States Department of Agriculture (USDA), over one in five young children are at risk of being overweight [25]. In the past decade alone, the number of overweight children ages 2-5 has increased 7% for boys, and 4% for girls. Obesity in childhood can have immediate consequences or increase the chances of weight-related problems in adulthood [26]. Some of these problems include psychosocial risks, cardiovascular disease, asthma, hepatic steatosis, sleep apnea, and type 2 diabetes.

#### *Diseases Prevalent in Kentucky*

According to the “Shaping Kentucky’s Future” report, Kentucky ranks third highest in childhood obesity and seventh highest for overweight adults in the country [27]. Kentucky is also ranked as the most inactive state in the country. Although smoking cessation is on the rise, Kentucky still leads the nation in teen tobacco use and is forty-ninth in adult tobacco use [28, 29]. Overweight, physical inactivity, and tobacco use are all preventable risk factors for cardiovascular disease which is the leading cause of death in the United States and Kentucky [30, 31].

### *Grains' Role in Weight Maintenance and Cardiovascular Disease Risk Factors*

To combat the aforementioned disease states, grain foods, especially whole grains, have become increasingly popular by after the issuance of the 2005 Dietary Guidelines and recommendations by health professionals [9, 32]. A study from Boston University found that subjects in the highest quintile of whole grain intake compared to those in the lowest quintile of whole grain intake had lower body mass index (BMI) ( $P < 0.0001$ ), weight ( $P < 0.004$ ), and waist circumference ( $P < 0.002$ ) [33]. In the same study whole grains were also inversely associated with total cholesterol ( $P < 0.02$ ) and LDL cholesterol ( $P < 0.04$ ). A clinical trial performed by Katcher et al examined if whole grain foods included in a hypocaloric (500 kcal/d reduction) diet enhanced weight loss and improved cardiovascular disease (CVD) risk factors [34]. As with the Boston University study, Katcher et al found that body weight, waist circumference, and percentage body fat decreased significantly ( $P < 0.001$ ). The whole grain group experienced a greater decrease in percentage body fat in the abdominal region than the refined grain group ( $P < 0.03$ ). In addition, C-reactive protein (CRP) decreased 38% in the whole grain group, but remained unchanged in the refined grain group ( $P < 0.01$ ). When examining whole grain's effect on weight status Melanson et al found that whole grains do attribute to decrease in weight [35]. Melanson's study monitored changes in nutrient intakes of overweight and obese subjects on weight management programs. The weight management program that prescribed a hypocaloric diet with fiber-rich whole grain cereals plus exercise decreased energy intake more than exercising only. By week 12, the hypocaloric diet with fiber-rich whole grain cereals plus exercise and the hypocaloric diet plus exercise decreased total fat more than exercise only.

### *Grains and Diabetes*

Type II diabetes mellitus (T2DM) has reached epidemic proportions in the United States and many other countries [36]. According to the Centers for Disease Control and Prevention, 11.3% of persons aged twenty and older have diabetes and about 250,000 people younger than twenty had diabetes type 1 or 2 [37]. Epidemiological studies strongly support intake of whole grain foods protect against the development of T2DM [36]. Three prospective studies by Liu *et al*, 2000, Meyer *et al*, 2000, and Fung *et al*, 2002 found that people consuming three servings or greater of whole grain foods had a 20-30% risk reduction compared with low consumers of whole grains [36, 38, 39, 40]. Fung *et al* found that the inverse association between whole grain intake and risk of T2DM was largely explained by fiber in the whole grains. A cohort study conducted in Finland of over four thousand men and women collected food consumption and data and performed a dietary history interview [41]. During a ten-year follow up, the study observed an inverse association between the intake of whole grains and the incidence of T2DM. As with the prospective studies, high fiber intake was associated with a reduced incidence of T2DM.

### *Cereal Fiber and Diabetes*

Cereal fiber has several components that have different effects on glucose metabolism [41]. Soluble fiber has been associated with reduced glucose and insulin responses, because of the retarding effect of soluble fiber on gastric emptying and absorption [42]. However, a closer relationship between insoluble fiber and the risk of T2DM has been reported [43]. It has been suggested that quicker intestinal transit from insoluble fiber allows less carbohydrates to be absorbed in the jejunum, relieving insulin

demand [44]. Through a prospective study, Schulze et al examined the association of glycemic index, load, and different sources of dietary fiber with incidence of T2DM in young women [45]. Results showed that a significant inverse association between total dietary fiber intake and risk of diabetes existed. Between cereal, fruit, and vegetable fiber, cereal fiber was most strongly associated with a decreased risk. Although studies have shown there is an inverse association between dietary fiber intake and diabetes, the biological mechanisms as to why this occurs is unclear [46]. A prospective study by the British Regional Heart Study (BRHS), found that in older men, total fiber intake was significantly and inversely associated with markers of diabetes, inflammation (C-reactive protein, interleukin-6, tissue plasminogen activator), and gamma-glutamyl transferase (GGT). This data suggests that a high fiber diet in older men may reduce the risk of diabetes, which may be explained by hepatic function and inflammatory processes.

#### *Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)*

Women, Infants, and Children (WIC), is a program that provides federal grants to states for supplemental foods, health care referrals, and nutrition education for low-income pregnant, breastfeeding, and non-breastfeeding postpartum women, and to infants and children up to age five who are found to be at nutritional risk [13]. Supplemental foods provided by WIC include allowances for food items such as juice, formula, milk, cereal (including whole grain), fruits, vegetables, beans, eggs, cheese, and meats. WIC also provides nutrition education and counseling, and screening and referrals to other health, welfare, and social services. In 2008, there were 9,540,481 women, infants, and children enrolled in the WIC program nation-wide [47]. Half of these participants were children (49.5%), a quarter were infants (25.5%), and the rest women (25.0%). In 2008,

60.3% of WIC participants reported their race as White only, 19.6% reported Black/African American only, 11.4% American Indian/Alaskan Native only, 3.5% reported Asian only or Native Hawaiian/Pacific Islander only, and 3.6% reported two or more races. For ethnicity, 42.1% of participants reported as Hispanic/Latino.

### *Kentucky WIC*

Data from December 2011 show that there are 134,178 WIC participants in the state of Kentucky for fiscal year 2011 [48]. Of these participants, 21.9% were women, 29.6% were infants, and 48.5% were children. As of 2008, out of a total 146,169 participants, 84.2% reported their race as White only, 11.68% reported Black/African American, 0.14% reported American Indian only, 1.60% reported Asian/Hawaiian/Pacific Islander Only , and 2.38% reported multiple races [49]. For ethnicity 8.06% of participants reported as Hispanic/Latino.

### *WIC Food Packages and Weight Status*

WIC food packages have mostly been unchanged since its creation in 1972 until recently [50]. The Institute of Medicine (IOM) cited four trends as the reason for revising WIC food packages: demographic changes in the WIC population, increased variety in the food supply, changes in consumption patterns, and changes in the health risks of the WIC-eligible population. When compared to the women and children of the 1970s, women and children today are less likely to be undernourished and more likely to be overweight. Although there is no evidence that WIC participation contributes to the risk of being overweight, several WIC food packages provide more than the recommended amount of milk, milk products, and fruit juice. In addition, packages did not include

recommended varieties of fruit, vegetables, and whole grains. Though there is no correlation between WIC participation and overweight, there is between socioeconomic status and overweight [51]. Of children aged 2-4, 21% were found to be at risk for overweight or overweight and 4.0% were found to be underweight or at risk for underweight [50]. This data also found that higher-income nonparticipants had a statistically significant ( $p<0.05$ ) higher Healthy Eating Index (HEI) score for whole grains than WIC participants. Only 25% of WIC participants consumed whole grains as opposed to 41% of higher-income nonparticipants.

### *Interventions*

WIC has been one of the most successful federally funded nutrition intervention programs. Studies, reviews, and reports show that WIC is cost-effective in protecting or improving health status among women, infants, and children [52]. Examples of research that has promoted the efficacy of WIC are improved birth outcomes and savings in health care costs, improved diet and diet-related outcomes, improved infant feeding practices, and improved preconceptional nutrition status.

### *Impact of Providing Yogurt to Women Enrolled in WIC*

This study examined the impact of providing yogurt to (n=511) pregnant, breastfeeding, or postpartum women enrolled in WIC in California [53]. For the intervention, part of the WIC milk allowance was substituted for yogurt accompanied by education materials. Results showed that 86% of the women wanted to substitute some of their milk vouchers with yogurt and the majority (89%) redeemed the yogurt coupons. Intervention women reported a trend ( $P=0.9$ ) toward an increase in yogurt intake while not increasing

other dairy consumption. Results of this study demonstrate that WIC participants are receptive to change. In addition, since the WIC participants did not increase other dairy consumption while substituting yogurt, whole grains may possibly be increased in the diet of WIC participants without increasing other refined grain intake.

*Favorable Impact of Nutrition Education on California WIC Families*

A study by Lorrene et al explored the impact of statewide nutrition education on the behavior of families participating in the WIC program [54]. The study design utilized cross-sectional samples of WIC families pre and post education. Intervention education directed families to eat more, and a greater variety of fruits, vegetables, whole-grains and to drink lower-fat milk. Following nutrition education, women and caregivers reported increased recognition of education messages, positive movement in stage of change for target food items, and increased family consumption of fruits, whole grains, and lower-fat milk. Conclusions drawn from the study show that coordinated nutrition education in WIC can significantly influence consumption toward more healthful food choices.

### **Chapter 3: Research Purpose**

The purpose of this study was to examine Kentucky WIC participants' attitude and beliefs regarding food purchasing and grains, knowledge of benefits of consuming grains, and the amount of grains consumed in a two-week period.

#### **Research Questions**

1. Are there significant factors that make WIC participants decide to purchase one food over another (e.g. price)?
2. Do the majority of WIC participants look at the nutrition facts on the Nutrition Fact label?
3. What nutrition facts do WIC participants consider important?
4. After reading a prompt, do WIC participants consume enough grains in their diet?
5. What are the different types of grains that WIC participants are eating?
6. Are WIC participants aware of the benefits of consuming whole grains?
7. Are WIC participants purchasing whole grains?

## **Chapter 4: Methodology**

This study was designed to examine the Kentucky WIC participant's attitudes and beliefs regarding the purchasing, consumption, knowledge, and beliefs of grains and whole grains. Examination was accomplished by studying the results of questions administered through a survey. Surveys were administered in WIC clinics while WIC participants were in the waiting room, scheduling their appointment, or after a "quick WIC" lesson. All surveys were completed by December 2011 and data analysis was completed in February 2012.

### *Sample Selection*

WIC clinics in seven different Kentucky counties were chosen to participate in the study based on permission from clinic managers or Institutional Review Board (IRB) approval. The seven counties that participated were Barren, Bath, Daviess, Fayette, Rowan, Warren, and Wolfe. The Bluegrass, Eastern, Pennyroyal, and Western regions of Kentucky are represented in this study.

### *Data Collection*

Prior to any data collection, this study received IRB approval from the University of Kentucky IRB committee. To collect data, the researcher travelled to each WIC clinic once permission had been received from the clinic manager. Data collection occurred at three different areas that were decided by the clinic manager. These collection areas were in the waiting room, while the participant was scheduling their next appointment, or after a "quick WIC" lesson. Before the researcher administered a survey, WIC participants heard a summary of the study's purpose. In addition, each participant received a hand out

further explaining the research purpose, disclosing that the research will not violate their privacy, affect their WIC benefits, and that participation in the survey was voluntary. This hand out also listed the contact information of the researcher, thesis committee chair, and Institutional Review Board at the University of Kentucky.

Upon agreeing to participate in the study, each consenting WIC participant received a survey to complete. The researcher was available to answer any questions the participant may have had. In the case of Spanish speaking participants, a translator at the clinic read the survey and translated answers. Once a survey was completed, the researcher collected it from the participant.

### *Survey*

The survey was created by the researcher with input from thesis committee members and WIC clinic staff throughout the state. Registered Dietitians who are knowledgeable in the area of whole grains tested the survey for face and content validity. This helped establish questions that were a good measure of the concept of this research. Some questions in this survey were similar to questions used by other researchers in this area. The same survey was administered in each clinic. The survey elicited responses from participants to answer questions regarding demographics, shopping behaviors, knowledge, and beliefs regarding nutrition and grains.

### *Data Analysis*

Survey responses were entered and controlled in Microsoft Excel 2007. Data were analyzed using SPSS version 20 using chi-squared tests. Chi-squared tests were used to

compare demographic data of the sample population with the results from non-demographic survey questions. A p-value of .05 or less was considered significant.

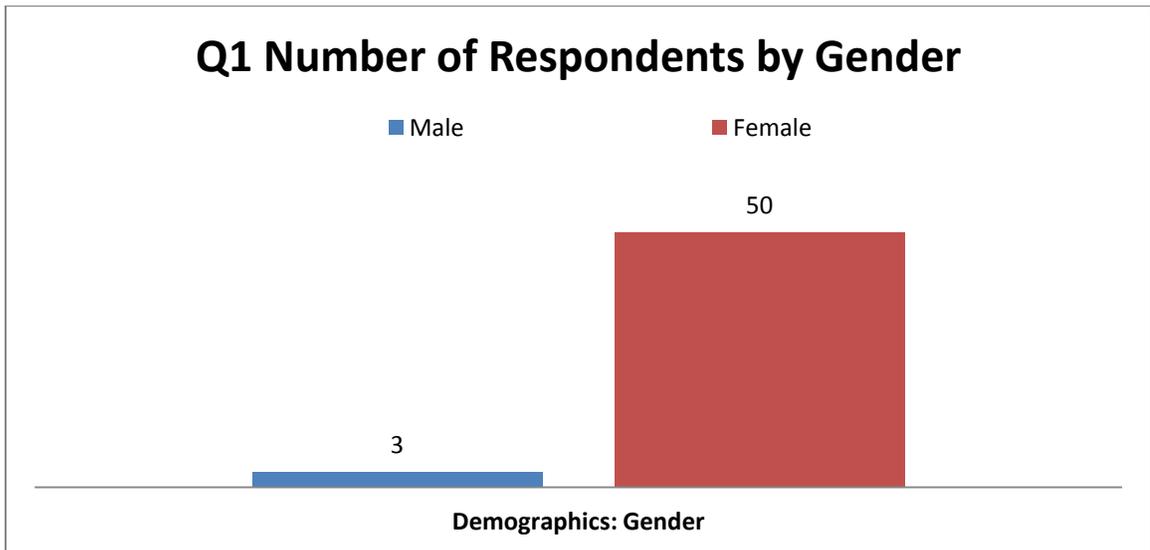
**Chapter 5: Results**

The total sample size consisted of 53 respondents from all seven counties. The seven counties represented in these results are Barren County, Bath County, Daviess County, Fayette County, Rowan County, Warren County and Wolfe County.

*Demographics*

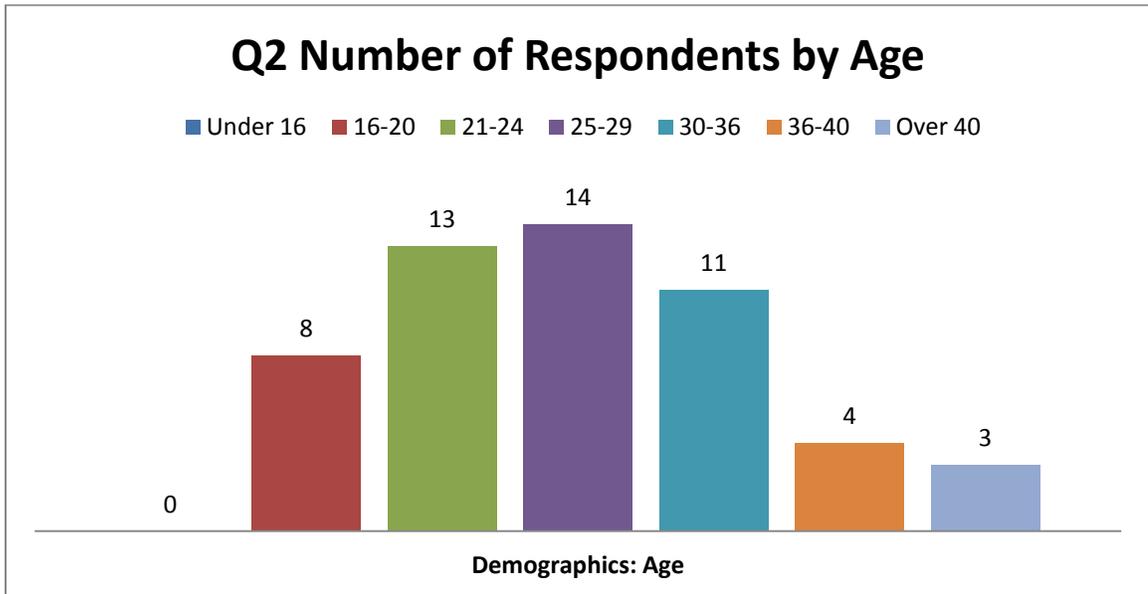
Of the 53 respondents, fifty were female and three were male.

**Table 5.1: Gender**



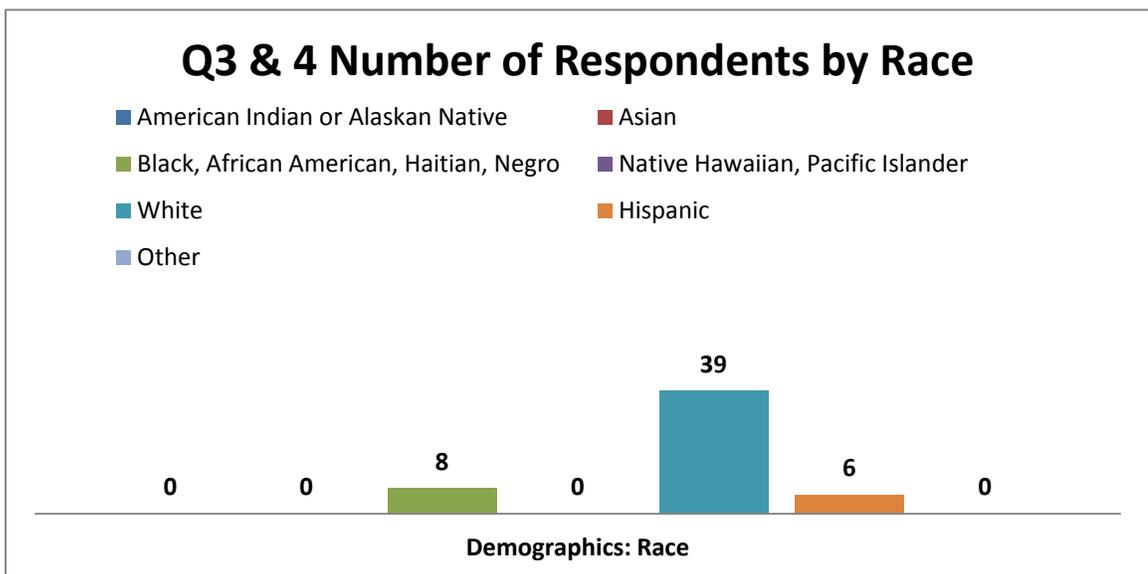
The age range for respondents was from 16 and under to 40 and older. The majority of respondents fell within the 25-29 age range and none of the respondents indicated being younger than 16 years old. Of the respondents 15.1% were 16-20 years of age, 24.5% were 21-24 years of age, 26.4% were 25-29 years of age, 20.7% were 30-36 years of age, 7.6% were 36-40 years of age, and 5.7% were over 40 years of age.

**Table 5.2: Age**

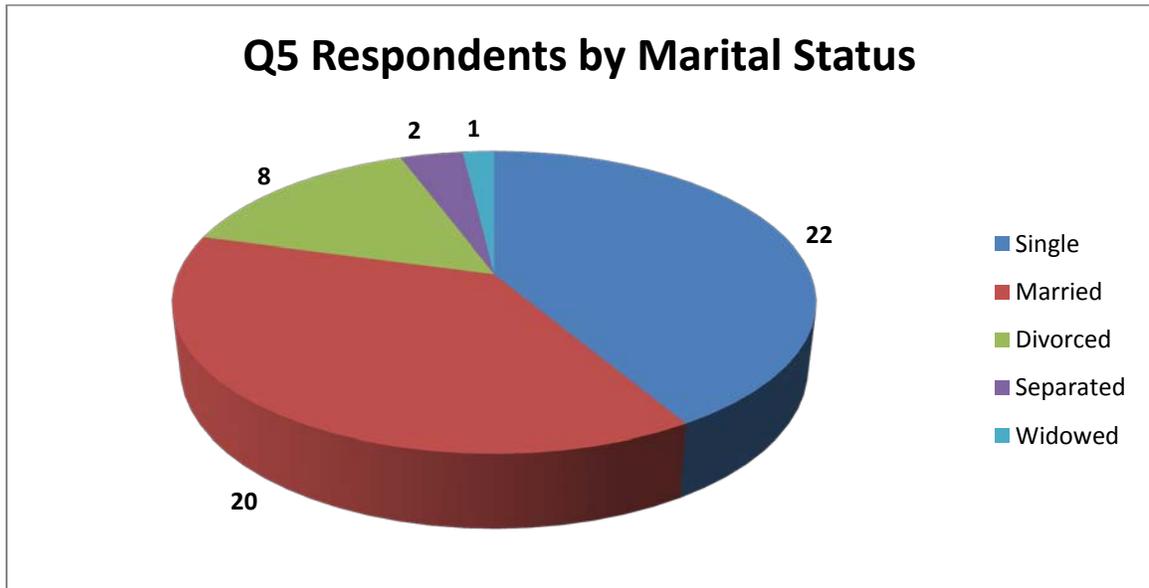


When asked what race or ethnic group they identified with, the majority of participants selected White 73.6% (n=39). Black, African American, Haitian, or Negro comprised 15.1% (n=8) of the total, and the remaining were Hispanic, Latino, or Spanish at 11.3% (n=6).

**Table 5.3: Race**

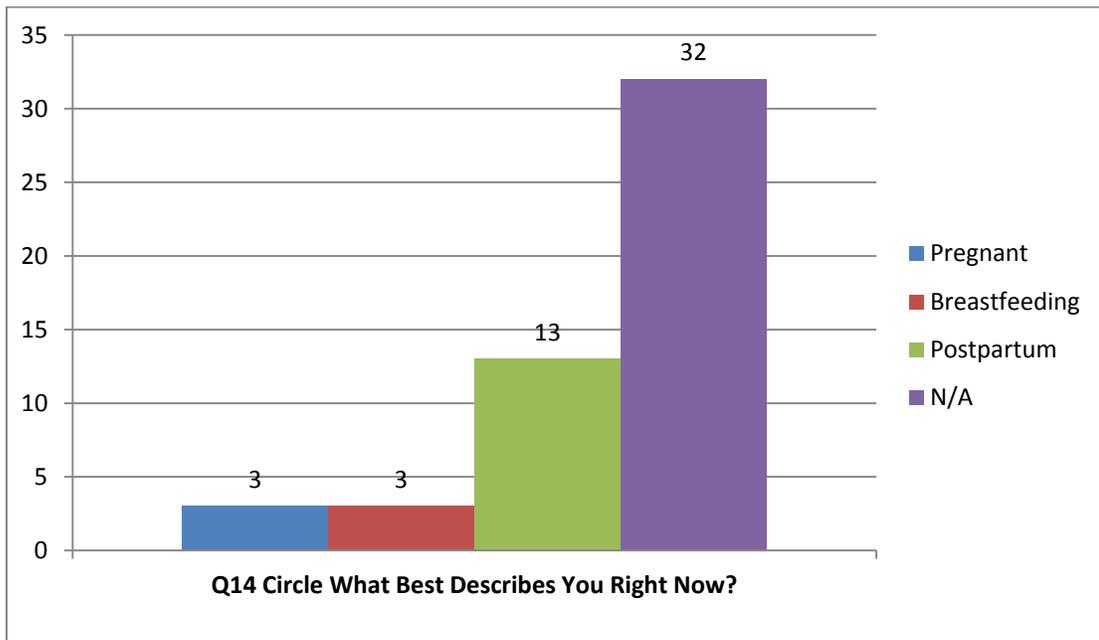


**Table 5.4: Marital Status**



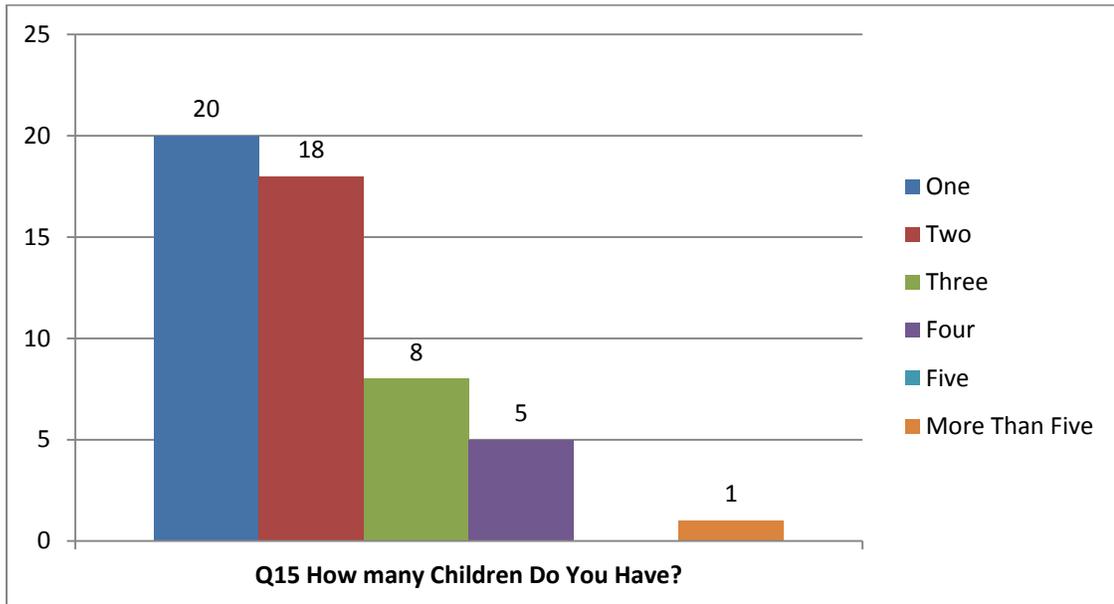
The majority of survey respondents identified themselves as being single (41.5%, n=22). The next highest response was married (37.7%, n=20) followed by, divorced (15.1%, n=8), separated (3.8%, n=2), and widowed (1.9% n=1).

**Table 5.5: Pregnant, Breastfeeding, Postpartum, N/A**



Of the participants, 60.3% (n=32), described themselves as “N/A” or not pregnant, breastfeeding, or postpartum. The remaining participants selected postpartum at 24.5% (n=13), breastfeeding at 5.7% (n=3), pregnant at 5.7% (n=3), and 3.8% (n=2) did not respond.

**Table 5.6: Number of Children**

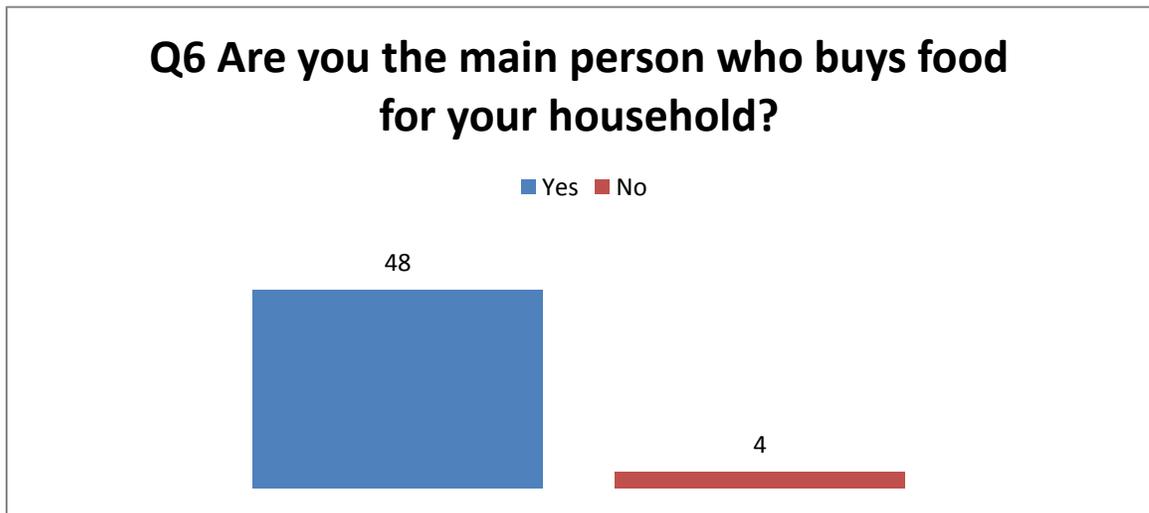


Question fifteen asked participants to indicate how many children they have. Of the participants 37.7% (n=20) indicated having one child, 34% (n=18) indicated having two children, 15.1% (n=8) having three children, 9.4% (n=5) indicated having four children, zero participants indicated having five children, 1.9% of participants (n=1) indicated having more than five children, and one participant did not respond.

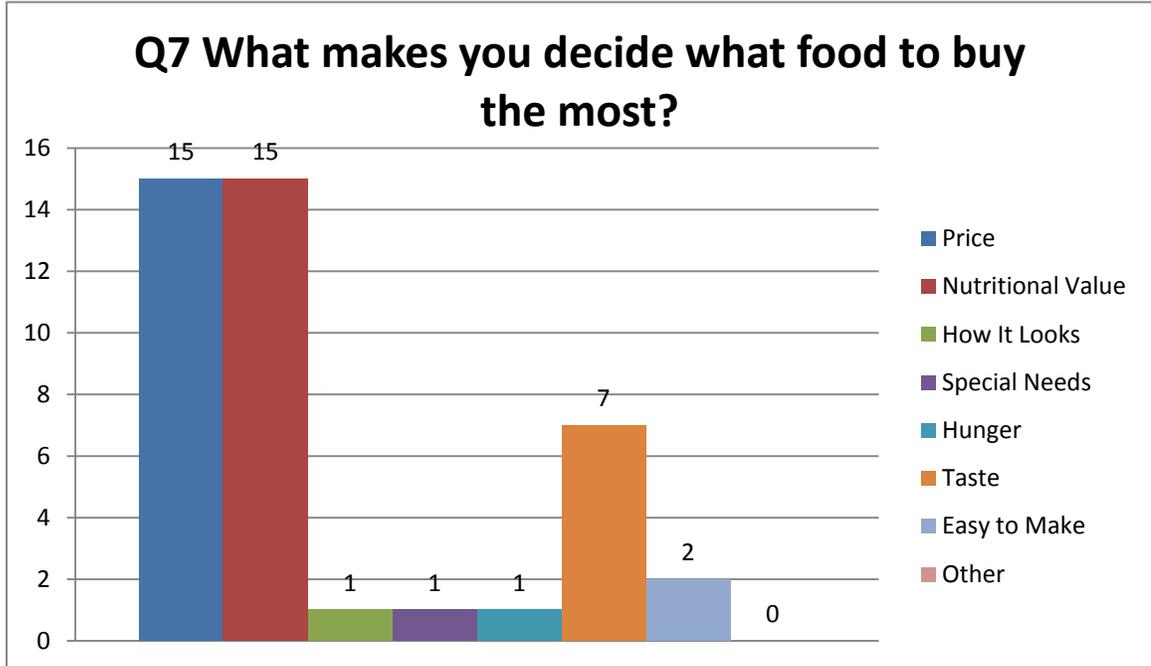
## Food Purchasing

Several questions on the survey deal with food purchasing. The first food-purchasing question, question six, asks participants if they are the main person who buys food for their household. Almost all participants responded “yes” at 90.5% (n=48). Four participants responded “no” (7.5%) and one survey did not have a response. Chi-squared analysis of question six found significance with question eight “when buying food do you look at the nutrition facts on the packaging?” p-value <0.00, question ten “would you say that you eat enough grains in your diet?” p-value 0.01, question nineteen: “have you bought whole grain foods before?” p-value 0.04, question twenty “...knowing that whole grains are a healthier choice for you are you more likely to buy them now if not before?” p-value <0.00, and question twenty-one “would you like to have more information on the types and benefits of grains?” p-value 0.01.

**Table 5.7: Main Purchaser**

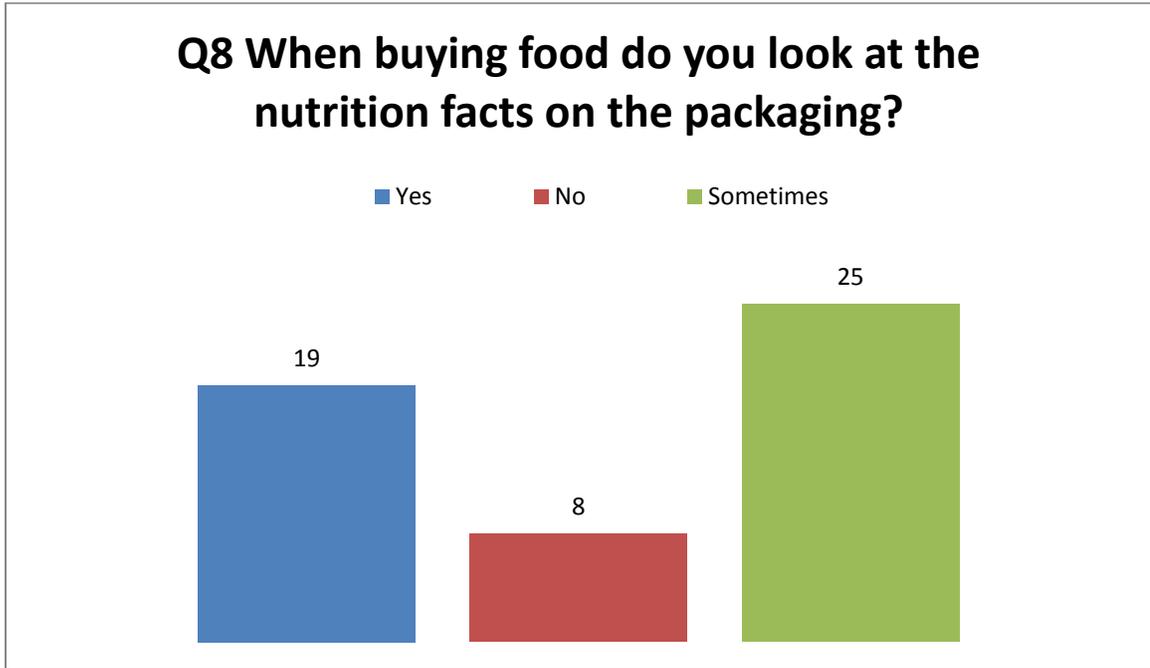


**Table 5.8: Main Purchasing Factor**



Question seven asked participants “what makes you decide what food to buy the most?” Of the participants, 28.3% (n=15) selected price and another 28.3% (n=15) nutritional value. The remaining participants selected taste at 13.2% (n=7), easy to make at 3.8% (n=2), how it looks at 1.9% (n=1), special needs at 1.9% (n=1), hunger at 1.9% (n=1), other at 0.0%, and eleven participants selected multiple answers contrary to directions stating to select only one answer. Chi-squared analysis of this question with all other questions found several significant comparisons. The first comparison, question seven with question three “what race/ethnic group best fits you?” resulted in a p-value of 0.01. The next significant comparison was with question eight “when buying food do you look at the nutrition facts on the packaging?” resulting in a p-value <0.00. When compared with question ten “would you say that you eat enough grains in your diet?” a p-value of 0.02 resulted. Lastly, when compared with question eleven “how many servings of grains do you eat on most days?” 0.01 was the resulting p-value.

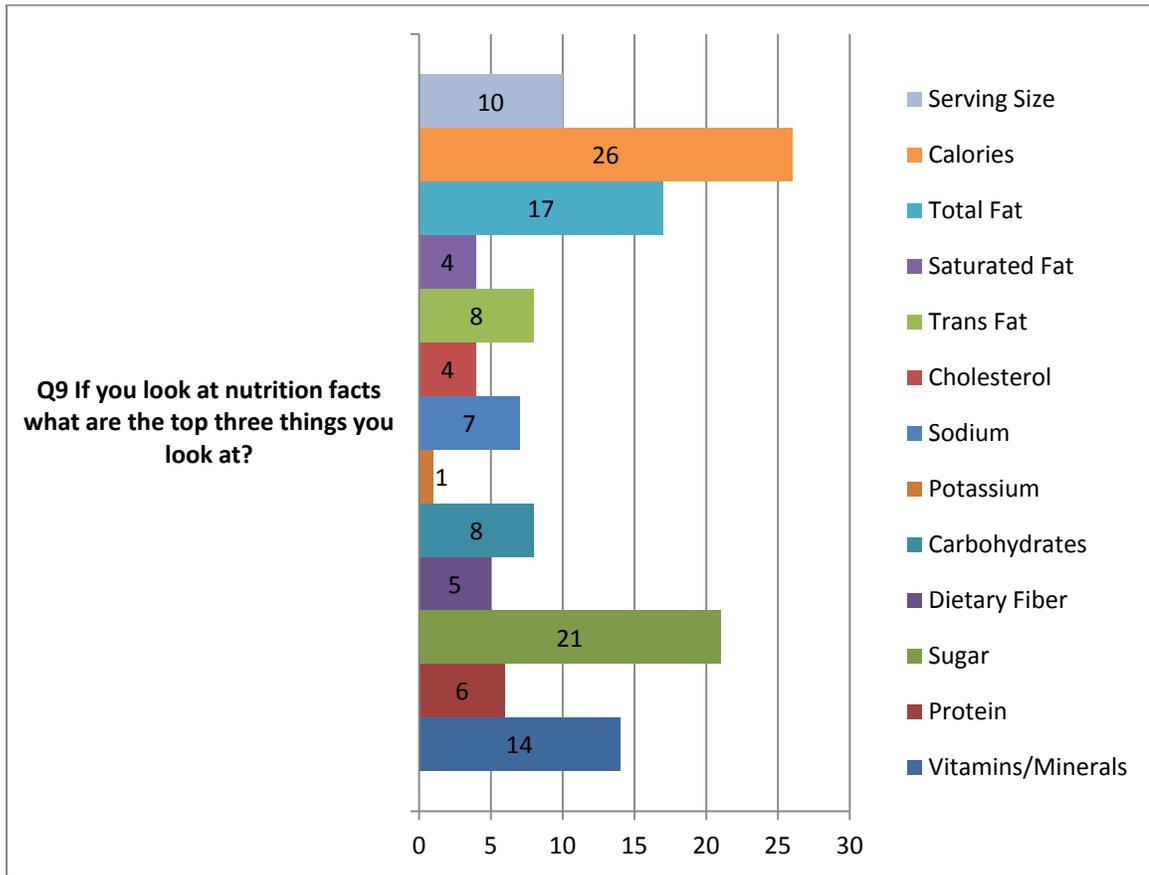
**Table 5.9: Participant Examination of Nutrition Facts**



The next food-purchasing question asks participants if they look at nutrition facts on packaging when purchasing food. Nearly half of the participants, 47.2% (n=25) selected that they “sometimes” look at nutrition facts on packaging when buying food. Of the remaining participants, 35.8% (n=19) selected “yes” they look at nutrition facts on packaging, 15.1% (n=8) selected “no” they do not look at the nutrition facts on packaging when buying food, and 1.9% (n=1) did not respond to the question. When examining significance, chi-squared analysis found question eight significant with question one “Are you male or female?” at p-value 0.05. Other significance found was with question six at p-value<0.00 and question seven p-value<0.00.

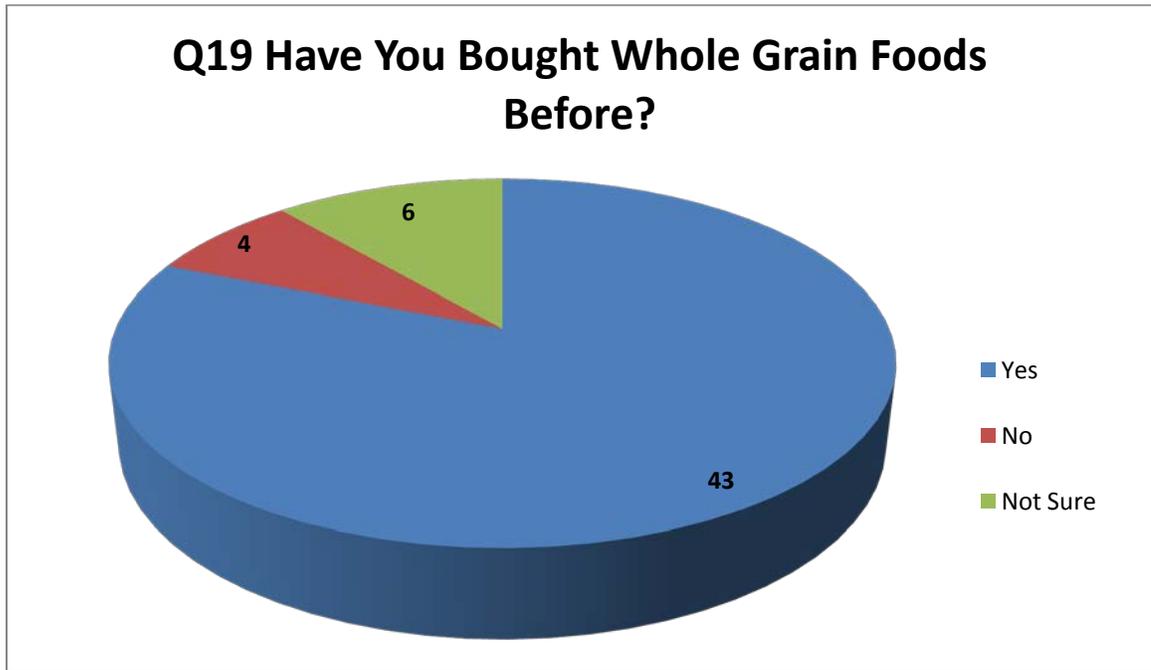
Participants that responded “yes” or “sometimes” to question eight were asked, “what are the top three things (nutrients) you look at?” in question nine. The top three

**Table 5.10: Top Three Nutrition Facts Examined by Participants**



nutrients out of all participants' responses were calories (n=26), sugar (n=21), and total fat (n=17). These were followed by vitamins and minerals (n=14), serving size (n=10), carbohydrates (n=8), trans fat (n=8), sodium (n=7), protein (n=6), dietary fiber (n=5), cholesterol (n=4), saturated fat (n=4), and potassium (n=1). Four participants did not respond to the question and several circled less than three choices.

**Table 5.11: History of Whole Grain Purchasing**

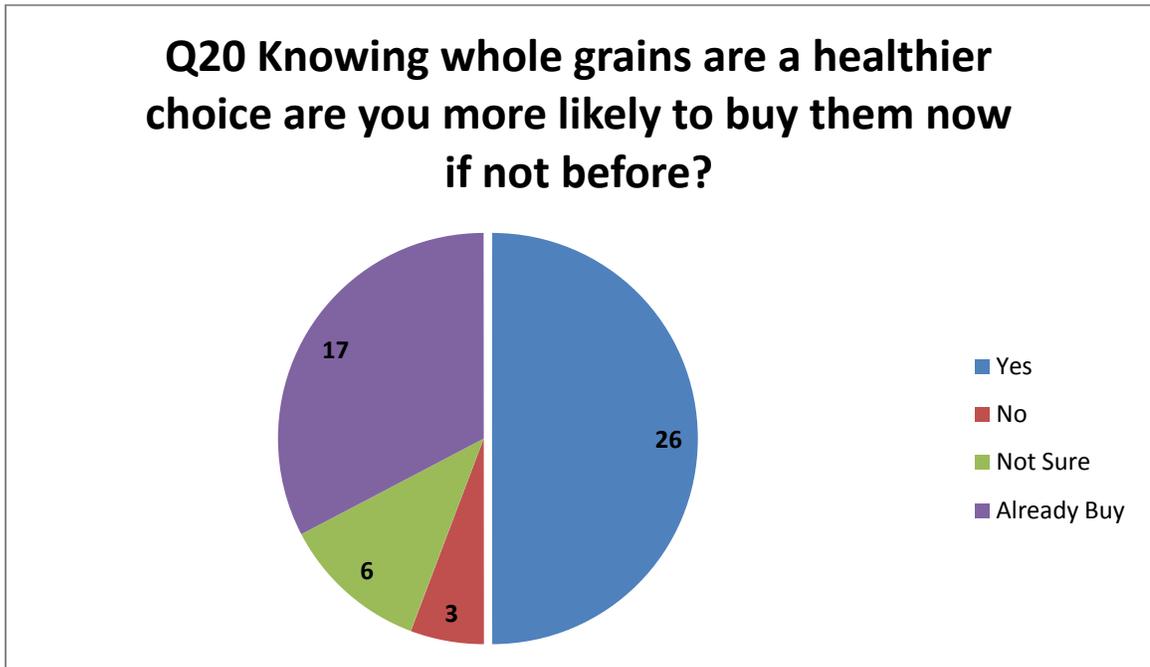


Question nineteen asks participants “have you bought whole grains before?” Almost all of the participants, 81.1% (n=43) answered “yes” that they have purchased whole grain foods before. Of the remaining participants 11.3% (n=6) answered not sure and 7.5% (n=4) answered no. When examining significance, Chi-squared analysis found that question nineteen was significant with question three “what race/ethnic ground best fits you?” at p-value 0.03. Chi-squared analysis of question nine with question six found a significance of p-value 0.04. When compared with question ten, “would you say that you eat enough grains in your diet?” Chi-squared analysis found a significance of p-value 0.02. Question fifteen “how many children do you have?” was found to be at a p-value of 0.02 when compared with question nineteen. Chi-squared analysis of question nineteen with question sixteen “would you say that your children eat enough grains?” found a p-value of 0.02. Lastly, Chi-squared analysis of question nineteen with question twenty

“...knowing that whole grains are a healthier choice for you are you more likely to buy them now if not before?” resulted in a p-value <0.00.

The last question dealing directly with purchasing (question twenty) asked participants: “Many whole grains foods are offered on the WIC program. Knowing that whole grains are a healthier choice for you are you more likely to buy them now if not before?” Of the participants, 49.1% (n=26) selected “yes” that they are more likely to buy whole grains now, 32.0% (n=17)

**Table 5.12: Likeliness of Buying Whole Grains**



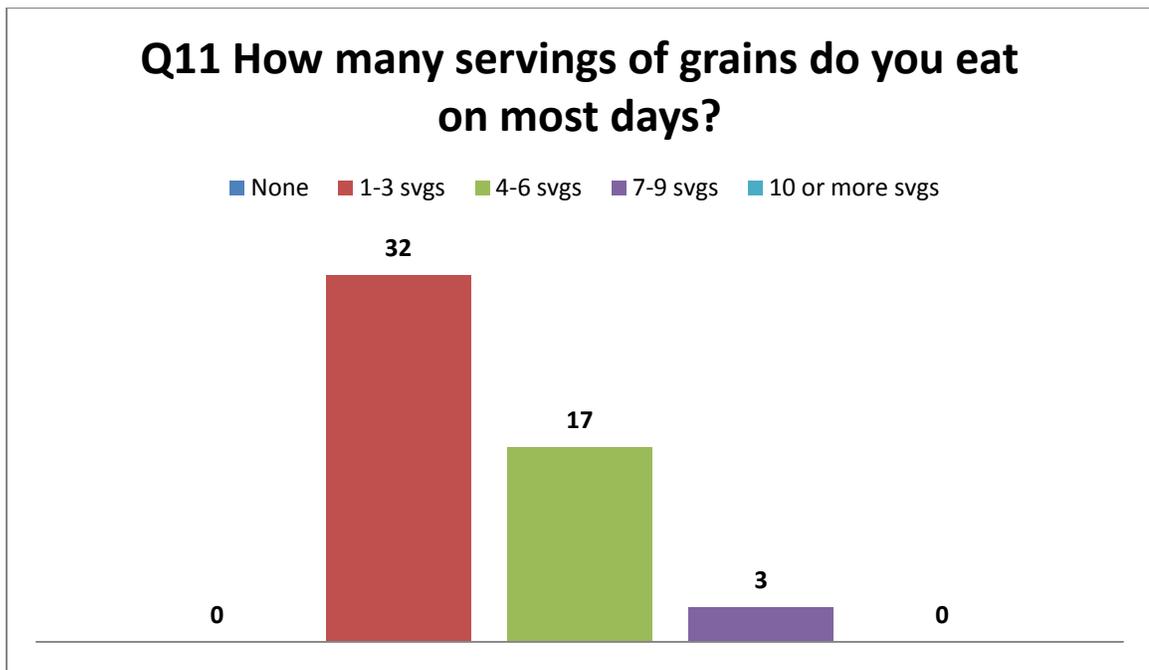
selected “already buy”, 11.3% (n=6) selected that they are “not sure”, 5.7% (n=3) selected no, and 1.9% (n=1) did not respond to the question. Chi-squared analysis found question twenty to be significant with question six “are you the main person who buys food for your household?” p-value< 0.00, question ten “would you say that you eat

enough grains in your diet?” with a p-value < 0.00, and question nineteen “have you bought whole grain foods before?” with a p-value < 0.00.

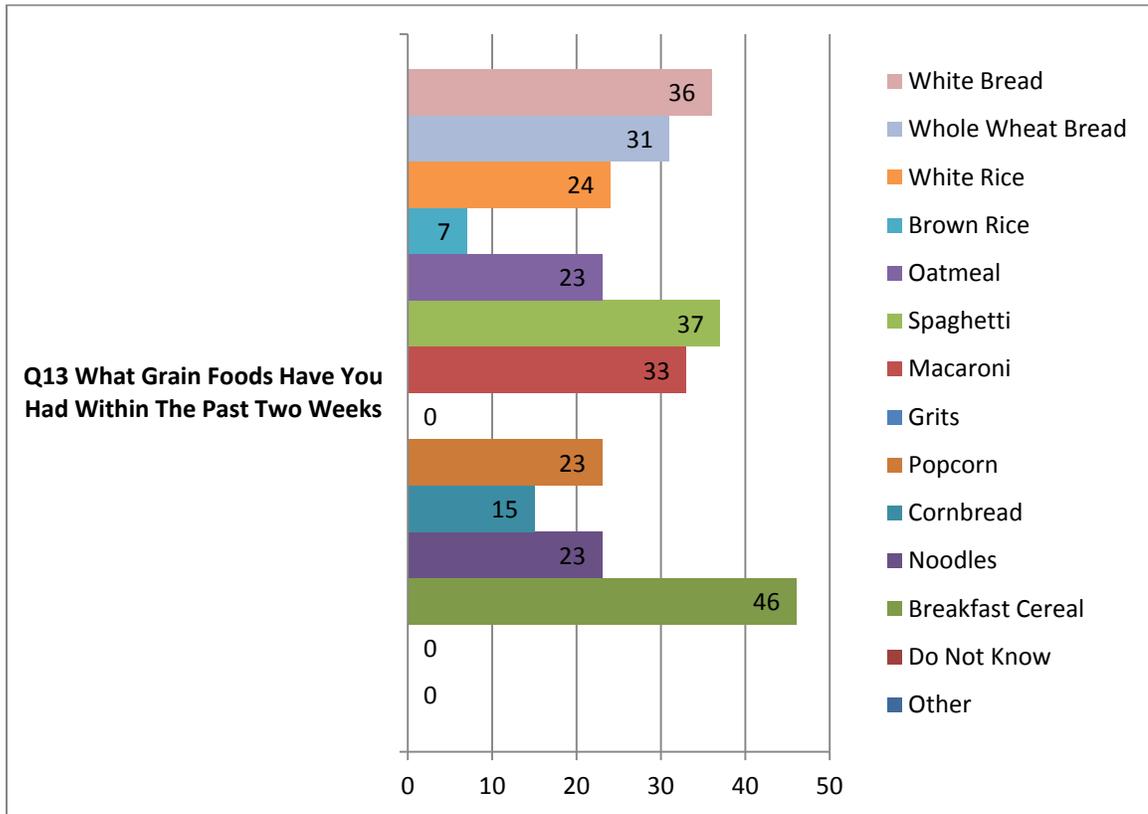
### *Grain Consumption*

Participants were asked questions that examined their grain consumption and types of grains consumed. The first consumption question, question eleven, asked participants “how many servings of grains do you eat on most days?” The majority of respondents, 60.4% (n=32) selected “1-3 servings”, 32.1% (n=17) selected “4-6 servings”, 5.6% (n=3) selected “7-9 servings”, zero participants selected “none”, and one participant did not respond. Chi-squared analysis found question eleven significant with question seven resulting in a p-value of 0.01 and question eighteen “were you already aware of the term whole grain?” with a p-value of 0.04.

**Table 5.13: Servings of Grains Consumed on Most Days**



**Table 5.14: Grain Foods Consumed Within the Past Two Weeks (Adult)**

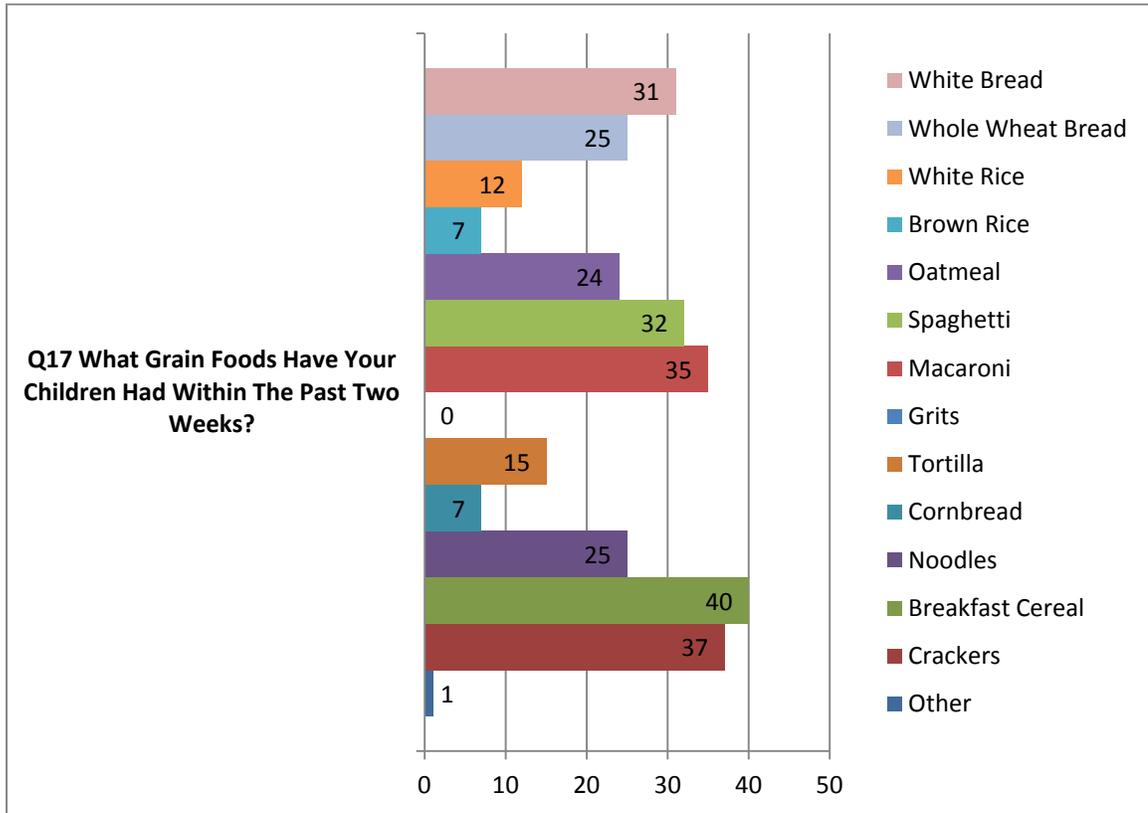


Question thirteen asked participants to indicate what grain foods they have had within the past two weeks. Almost all of the participants selected breakfast cereal (n=46), followed by spaghetti (n=37), white bread (n=36), macaroni (n=33), whole wheat bread (n=31), white rice (n=24), noodles (n=23), oatmeal (n=23), popcorn (n=23), cornbread (n=15), and brown rice (n=7).

Question seventeen is similar to thirteen except that it asks participants to indicate what grain foods their children have had within the past two weeks. As with question thirteen breakfast cereal was the most selected item (n=40), followed by crackers (n=37), macaroni (n=35), spaghetti (n=32), white bread (n=31), noodles (n=25), whole wheat

bread (n=25), oatmeal (n=24), tortilla (n=15), white rice (n=12), brown rice( n=7), cornbread (n=7), and other (n=1).

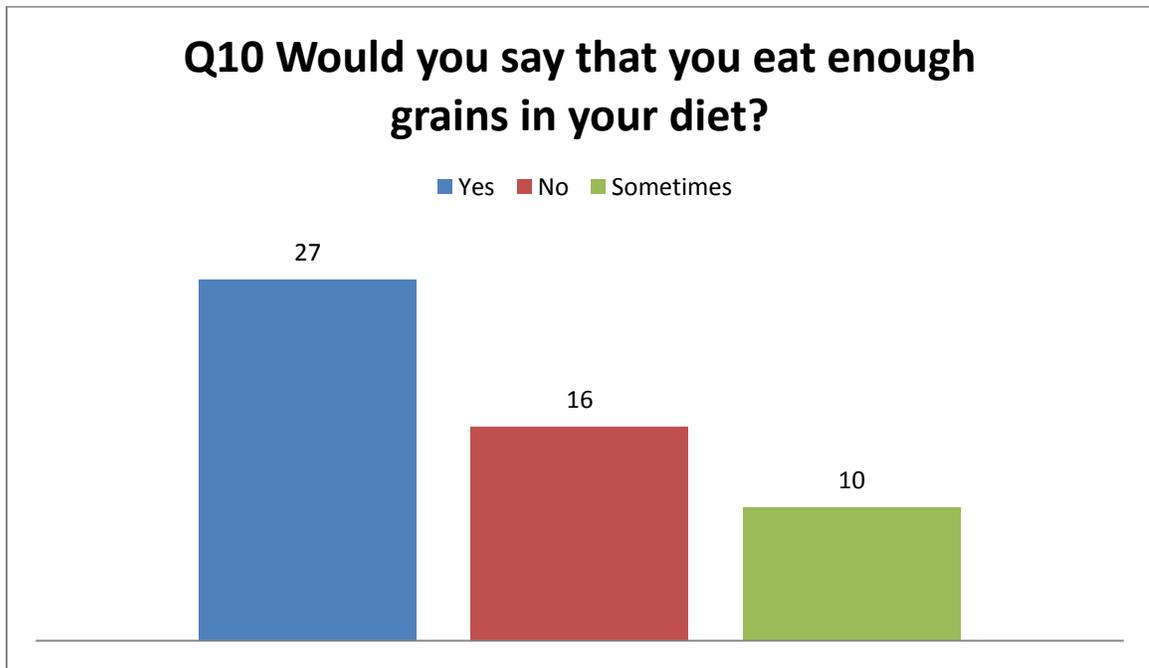
**Table 5.15: Grain Foods Consumed Within the Past Two Weeks (Children)**



*Beliefs, Attitudes, and Awareness*

Several questions examined the participants' beliefs, attitudes, and awareness of nutrition information, and grain consumption. The first of such questions, question ten, asked the participant "would you say that you eat enough grains in your diet?" Half of the participants (50.9% n=27) selected, "yes" they do eat enough grains in their diet. The remaining participants selected "no" at 30.2% (n=16) and "sometimes" at 18.9% (n=10). Chi-squared analysis found question ten significant with question six at p-value 0.01, question seven at p-value 0.02, question sixteen "would you say that your children eat enough grains?" at p-value<0.00, question nineteen at p-value 0.02, and question twenty at p-value<0.00.

**Table 5.16: Grain Consumption Belief (Adult)**

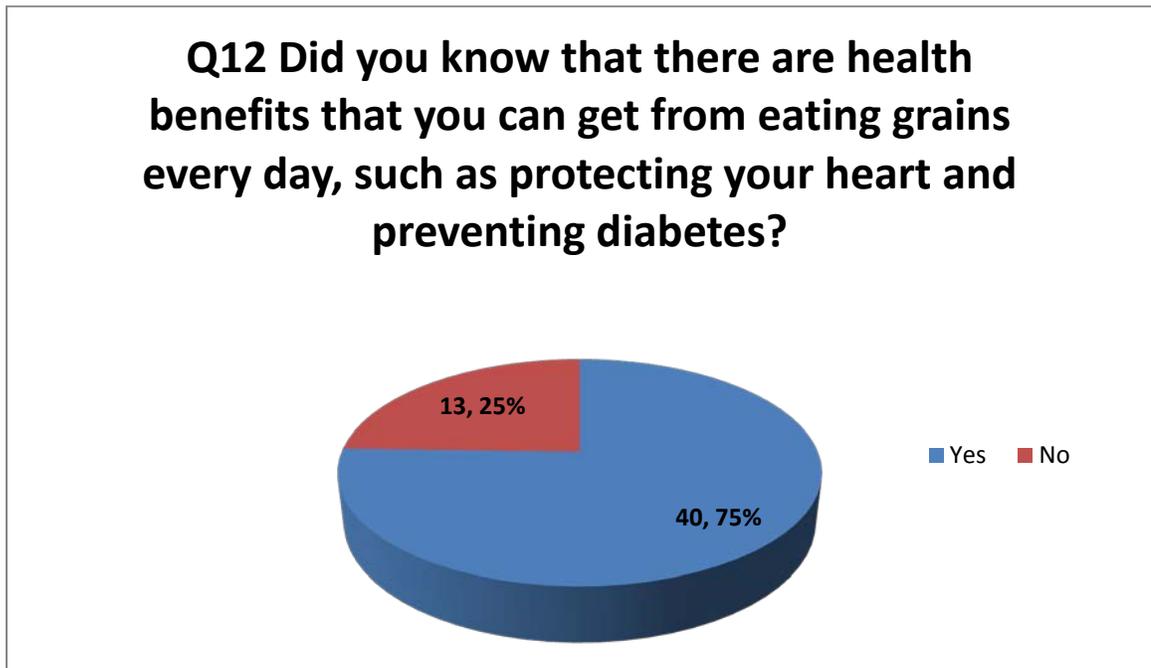


Some questions had prompts or explained the benefits of consuming grains.

Question twelve asks participants "did you know that there are health benefits that you

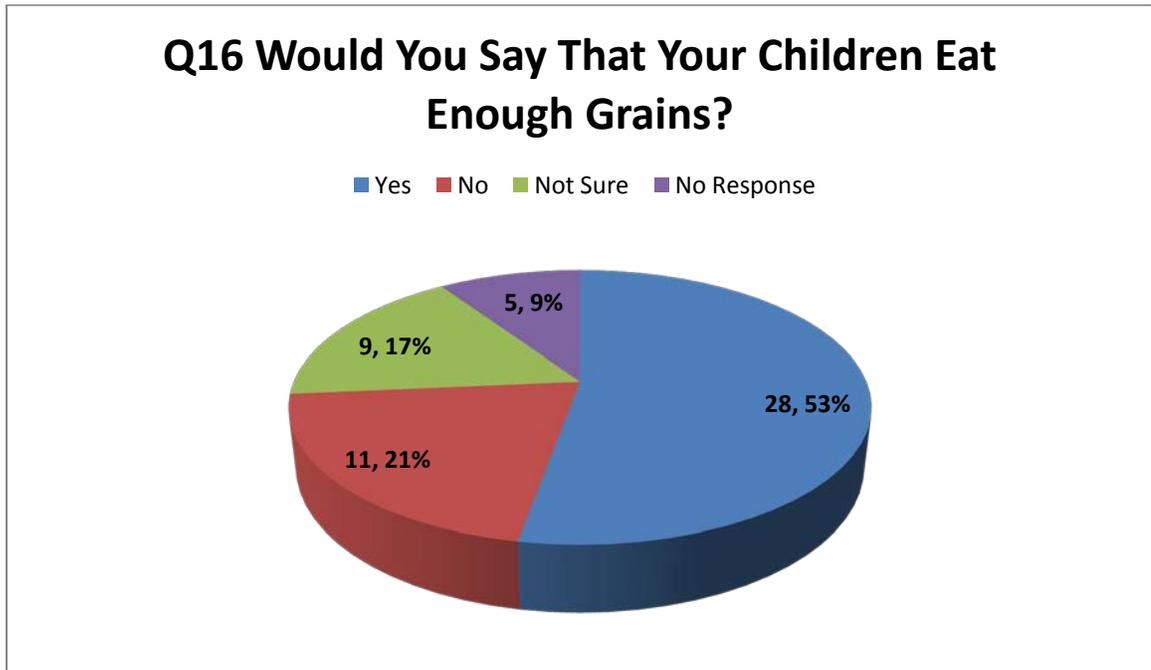
can get from eating grains every day, such as protecting your heart and preventing diabetes?” The majority of

**Table 5.17: Knowledge of Health Benefits**



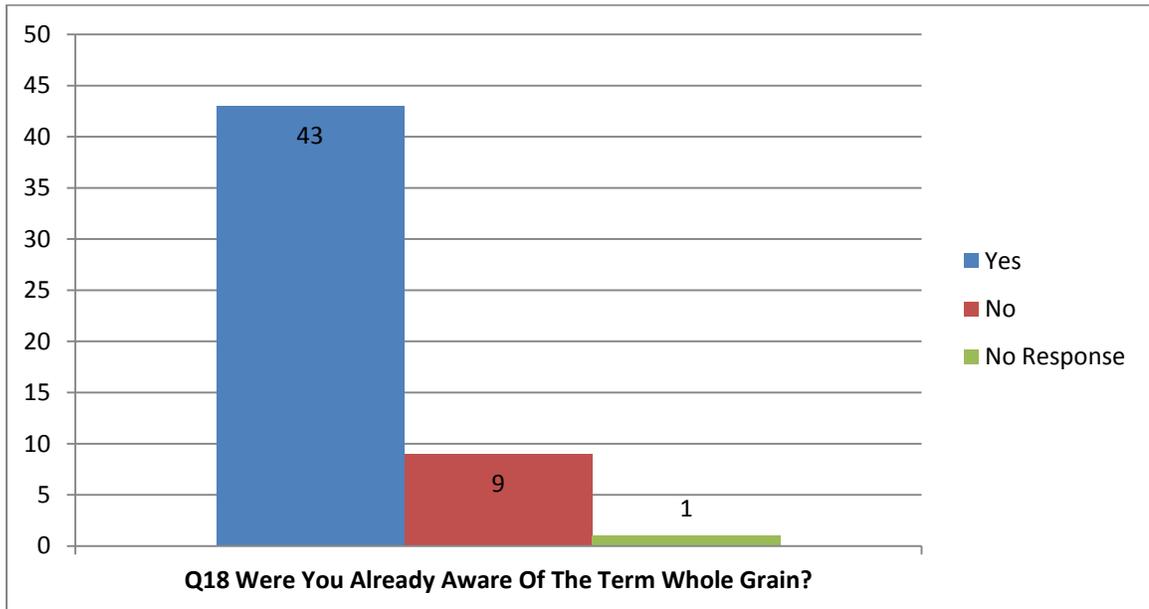
respondents (75%, n=40) selected “yes” that they were aware of the benefits of consuming grains every day. The remaining participants (25%, n=13) selected “no” they were not aware of benefits. Chi-squared analysis found question twelve significant with question sixteen with a p-value<0.00 and with question nineteen with a p-value of 0.01.

**Table 5.18: Grain Consumption Belief (Children)**



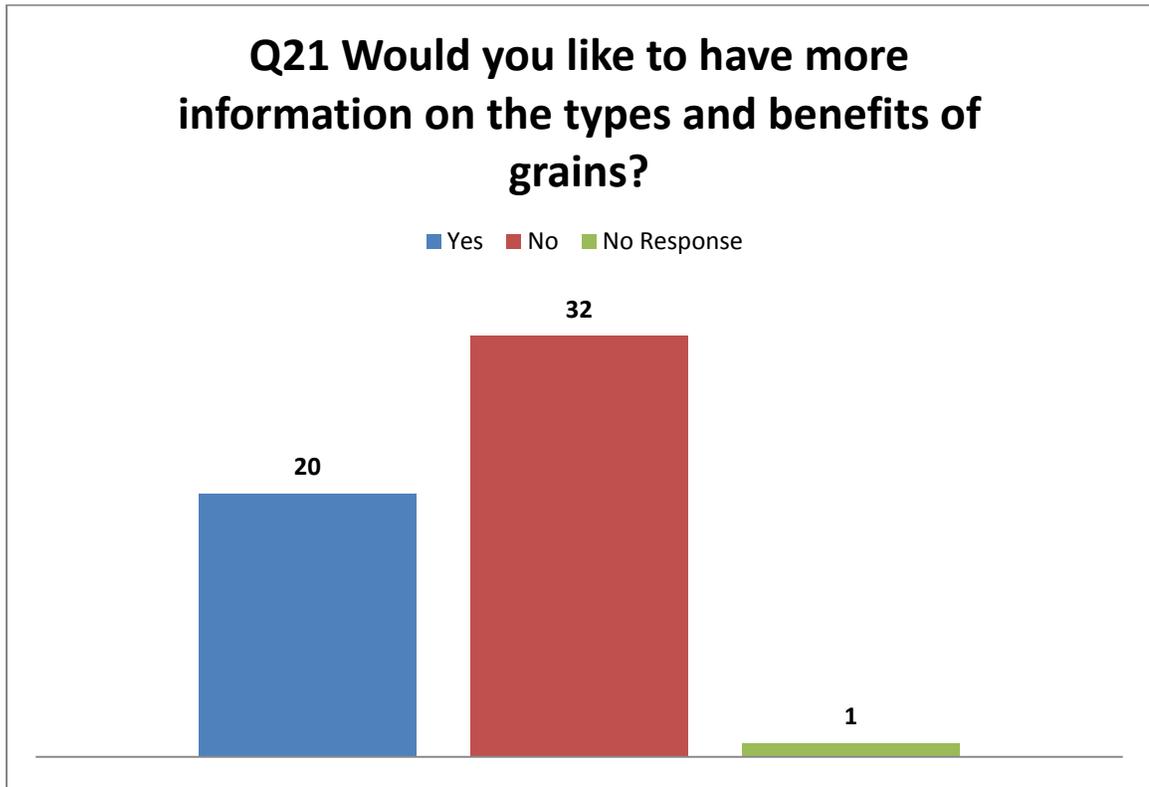
Question sixteen asked participants if they “would say that their children eat enough grains?” More than half of the participants, 58% (n=28), selected “yes”, 23% (n=11) selected “no”, 19% (n=9) selected not sure, and 9.4% of participants did not respond. Chi-squared analysis found that question sixteen was significant with question ten at p-value <0.00 and question seventeen at p-value 0.02.

**Table 5.19: Awareness of Whole Grains**



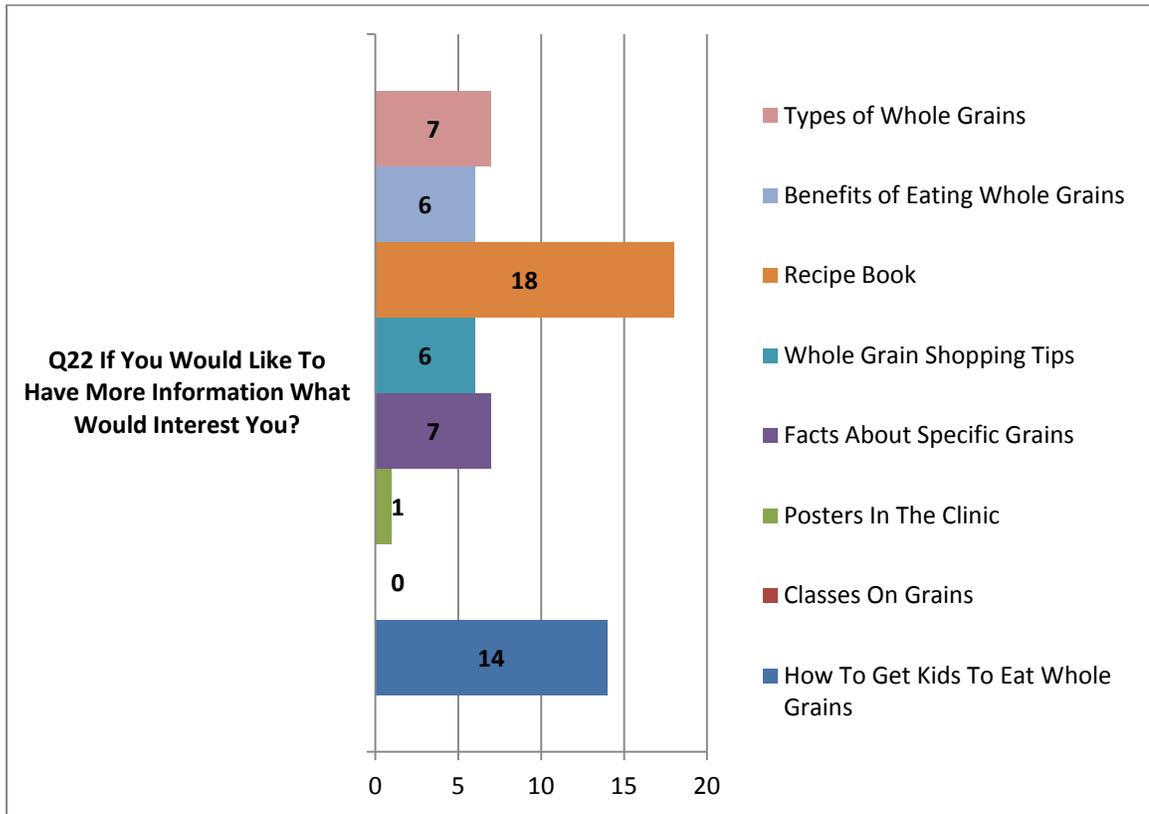
Participants were asked, “were you already aware of the term whole grain?” in question eighteen. Of the participants, 81.1% (n=43) responded that they were already aware of the term whole grain. Of the remaining participants 17.0% (n=9) responded that they were not aware of the term whole grain and 1.9% (n=1) did not respond to the question. When examining significance, Chi-squared analysis found question eighteen significant with question eleven at p-value 0.04, question twelve at p-value <0.00, and question nineteen at p-value 0.01.

**Table 5.20: Additional Information Desired**



Question twenty-one asked participants if they would like to have more information on the types and benefits of grains. More than half of the participants, 60.4% (n=32), selected that they would not like to have more information. The remaining participants, 37.7% (n=20) selected “yes” they would like to have more information and one participants (1.9%) did not respond. Chi-squared analysis found question twenty-one significant with question one at p-value 0.05, question three at p-value 0.04, question four at p-value 0.05, question six at p-value 0.01, question twelve at p-value 0.01, and question eighteen at p-value 0.01.

**Table 5.21: Type of Information Desired**



Participants that answered “yes” to question twenty-one were asked in question twenty-two information would interest them. A grain recipe book interested participants the most (n=18) followed by how to get kids to eat whole grains (n=14), facts about specific grains (n=7), types of whole grains (n=7), benefits of eating whole grains (n=6), whole grain shopping tips (n=6), and posters in the clinic (n=1).

## **Chapter 6: Discussion**

The purpose of this study was to examine Kentucky WIC participants' attitudes and behaviors regarding food purchasing and grains, knowledge of benefits of consuming grains, and the amount of grains consumed in a two-week period. These factors were measured through a survey administered by the researcher to WIC participants in several counties across the state of Kentucky.

### *Demographics*

Most participants of this study were 21-36 years old. Although, ages were grouped differently in WIC Participant and Program Characteristics of 2008, 18-34 years old was the largest age group of total women at 85.5% of all participants [47]. The next largest age group in of total women was 35 or more years at 8.3%, 15-17 years old at 5.8%, and 15 years or younger at 0.3%.

Of all participants in this research, 73.6% identified themselves as White, 15.1% as black, and 11.3% as Hispanic. Nationally, 60.3% of WIC participants identified themselves as White with the remaining being minorities [47]. Participants that identified themselves as Hispanic or Latino made up 42.1% of all program participants. For Kentucky, 84.2% of Kentucky WIC participants reported their race as White only with the remaining being minorities [49]. Only 8.06% reported Hispanic ethnicity.

A large percentage of survey participants (41.5%) identified that they were "single". The remaining participants were married (37.7%), divorced (15.1%), separated (3.8%), and widowed (1.9%).

More than half of the participants in this study, 60.4% reported themselves as being past postpartum (infant –five years old). Nationally, the percentage of participants that reported being past postpartum was 75.0% [47]. Of the remaining participants, 24.5% reported being “postpartum” compared to 7.4% nationally, 5.6% reported they were breastfeeding compared to 6.9% nationally, and 5.6% reported they were pregnant compared to 10.7% nationally.

In 2008, 27.3% of all WIC participants lived in a household of four [47]. This was followed by three persons household at 25.4%, five persons household at 18%, six or more persons household at 14.9%, two persons household at 12.0%, and 1 person’s household at 1.2%. This survey did not measure household size, but participants were asked how many children are in their household and how old their children are. Among the participants, 37.7% had one child. Participants having two children were 34%, three children 15.1%, four children 9.4%, five children 0.0%, and five or more children 1.9%.

### *Food Purchasing*

Part of this research attempted to identify food purchasing beliefs and decisions of the WIC participants. The first food purchasing question, question six, asked participants if they were the main person who buys food for their household. Almost every participant (90.5%, n=48) selected “yes” they were the main person. In question seven, participants were asked what makes them decide what food to buy the most. Results found that most participants were concerned with price and nutritional value. A study by Anderson et al found that when nutrition education and coupon (for farmers’ market produce) interventions were performed, fruit and vegetable consumption and coupon use increased [55]. Almost all of the participants in this research were female. These participants act as

“gatekeepers” to the home, and education should be directed towards them as results show they are the ones purchasing food. This study demonstrated WIC participants are receptive to education that will help them determine a food’s nutritional value. The study also showed that WIC participants willing to use alternatives such as farmer’s markets coupons that can help curb issues such as price. These two interventions might be good tools for WIC participants stating they are the main food purchaser for their household.

Chi-squared analysis of question six with question eight, “when buying food do you look at the nutrition facts on the packaging?” (which 83.0% said “yes or “sometimes” to) resulted in a p-value <0.00. Although the majority of participants in this research either always or sometimes look at nutrition labels, some may have issues identifying important elements on the label. Marquart et al found that even individuals with relatively extensive experience with whole grains (like food and nutrition professionals) are often confused on how to use labels to identify whole grain products [9]. These findings suggest that WIC participants may benefit from label reading education to make better-informed purchasing decisions.

Question nine asked participants to select the top three nutrition facts they look at. Some participants that previously selected that they do not look at nutrition facts when purchasing food or are not the main food purchaser in their household, participated in this question. The top three nutrients selected by participants were “calories”, “sugar”, and “total fat”. Only 9.4% of participants selected dietary fiber as one of the top nutrients they look at. NHANES 1999-2004 found that mean daily energy intake was higher in WIC children than higher income nonparticipant children until age four [50]. For all children ages 2-4, percentage of energy consumed from solid fat and added sugar were

the same for WIC participant children and higher income nonparticipant children, and was significantly higher in income-eligible children. Dietary fiber intake for all children (WIC, income-eligible, and nonparticipant) were low compared to the adequate intake (AI) value of 14.9. There was no statistical difference for fiber consumption between children groups. Although WIC Participant and Program Characteristics 2008 did not measure specific nutrient intakes, 50.6% of total WIC women were at nutritional risk [47]. These findings show that although participants primarily look at calories, sugars, and total fat on packages, over consumption of calories and under consumption of important nutrients like fiber, occur. WIC participants may benefit from nutrient and label reading education.

In question nineteen, WIC participants were asked if they have purchased whole grain foods before. The majority of participants, 81.1% (n=43), responded that they have previously purchased whole grains. The percentage of participants who have purchase may increase as Whaley et al found, since the WIC package revisions, consumption of whole grain food has increased 17.3% (a 51% increase over baseline) [56]. Chi-squared analysis found question nineteen significant with question three (race) at p-value 0.03. Almost all of the participants that selected that they were White, Black, African American, Haitian, or Negro indicated that they have purchased whole grains before. However, half of the participants that indicated they were of Hispanic, Latino, or Spanish origin indicated that they have not purchased whole grain foods or were unsure if they have. Hispanic, Latino, or Spanish participants may benefit from education on whole grain label identification.

Participants were given a prompt before question twenty that discussed the health benefits from consuming whole grains. Question twenty then asked participants if they were more likely to purchase whole grains after reading the prompt than before. Half of the participants selected “yes” they were more likely to purchase whole grains. These results may indicate that both availability and education will increase participant consumption of target foods.

### *Grain Consumption*

This study asked WIC participants how many servings of grains they consume on most days, and to indicate what grain foods they and their children have consumed in the past two weeks. Following a prompt explaining serving size, question eleven asked participants how many servings of grains they eat on most days. Although most respondents selected “yes” or “sometimes” when asked if they believe they eat enough grains in their diet, over half of the participants (60.4%), selected only eating 1-3 servings of grains on most days. This falls below the USDA recommendation of 6-8 servings for adults [10]. A study by the USDA found during 1994-96 and 1998, Americans consumed 6.7 ounces of total grains per day, 5.6 ounces coming from refined grains and 1.1 ounces coming from whole grains [57]. Education to WIC participants on incorporating whole grains into recipes and how to introduce whole grain foods to children may increase consumption.

Questions thirteen and seventeen asked participants to select what food sources of grain foods they have had and their children have had within the past two weeks respectively. For adults, breakfast cereal, spaghetti, and white bread were the top three selections. For children, breakfast cereal, crackers, and macaroni were the top three

selections. Research by Harnack et al included a similar question, where through a dietary recall, the top three grain sources of children ages 2-18 were yeast breads, ready-to-eat cereals, and pizza [58]. Whole grain sources for the same group were ready-to-eat cereals, corn and other chips, and yeast breads.

Questions regarding method of food preparation and brand specific information were not included in the survey. However, results from questions thirteen and seventeen may warrant further investigation into how participants are preparing grain foods and nutrient density of purchased prepackaged grain foods. The 2010 Dietary Guidelines for emphasized helping consumers make nutrient dense food choices [59]. WIC participants may benefit from continued education on this topic.

#### *Beliefs, Attitudes, and Awareness*

Several questions on the survey attempted to identify the participant's beliefs, attitudes, and awareness towards grains. Over half the participants selected that they eat enough grains in their diet. This question was preceded by a prompt that explained serving sizes and gave examples of grain foods and their equivalent serving size. Chi-squared analysis with question eight, do you look at the nutrition facts on packaging resulted in a p-value of 0.02. Further examination of results found that most participants who selected yes, they eat enough grains in their diet, also examine nutrition facts on packaging. Participants that selected yes to question ten also indicated that they were aware of the term whole grain p-value <0.00.

The majority of participants (75%) selected yes to question twelve asked participants if they were aware of the health benefits they may get from consuming grains every day such as protection from heart disease and diabetes. Chi-squared analysis with

question nineteen “have you bought whole grain foods before?” resulted in a p-value of 0.01. Since most participants that responded “yes”, to both of these questions, this may suggest a direct relationship between knowledge and purchasing habits. This finding is contradictory to Marquart et al, who found that consumers might lack the ability to understand the health benefits of, and preparation and incorporation of whole grains into their diet [9].

Participants were asked if they would say their children eat enough grains. Of the participants, 52.8% (n=28) selected “yes”, 20.7% (n=11) selected “no”, and 17.0% selected “not sure”. Chi-squared analysis with question ten resulted in a p-value <0.00. This may suggest there is a direct relationship between the parent’s perception of eating enough grains in their diet and the amount of grains they perceive their children eat. The majority of participants that reported eating enough grains in their diet also reported their children did as well. As previously mentioned, although participants reported that they consumed enough grains in their diet, the serving size they indicated eating on most days fell below the recommended amount. This may suggest an inaccurate reporting of the children’s grains consumption as well.

Question eighteen asked participants if they were already aware of the term whole grain (this question was preceded by a prompt explaining whole grains). Almost all participants (81.1% n=43) indicated “yes” they were aware of the term whole grain and the remaining indicated “no”. Chi-squared analysis with question nineteen resulted in p-value 0.01. In addition, the number of participants that indicated they were aware of the term whole grain and the number of participants that indicated they have purchased whole grain foods before were the same (n=43). This may suggest a relationship between

WIC participant awareness/knowledge and purchasing habits. Chi-squared analysis with question twelve resulted in a p-value <0.00 showing significance between being aware of the term whole grain and the benefits of consuming grains. Almost all participants that selected “yes” to being aware of the term whole grain selected “yes” they were aware of the health benefits of consuming grains. These results may indicate WIC participants who are educated on whole grains and the benefits of consuming whole grains are more likely to purchase whole grains than those who are not.

In question twenty-one participants were asked if they would like to have more information on the types and benefits of grains there are. Over half of the participants (60.3%) indicated that they would not like to have more information on grains. Participants who were interested in additional information were asked to select from a list what type of information they would be interested in receiving. A recipe book was the most selected item followed by, information on how to get kids to eat whole grains, types of whole grains, facts about specific grains, benefits of eating whole grains, whole grain shopping tips, and having posters in the clinic. Majority interest in recipe books may indicate that participants struggle to prepare recipes that include whole grains or lack resources to purchase recipe books. In addition, participants may need assistance into incorporating more whole grains into their children’s diets.

### *Limitations*

There are several limitations to this study. The first limitation would be the survey sample size of WIC participants. The distance of outlying clinics from the researcher and participants missing clinic appointments limited sample size and the ability to perform any post-test or follow-up research. In addition, some survey sites had several more survey respondents than others, possibly creating an unbalanced representation of participants. Some questions on the survey asked participants to make estimates in their diet or to recall food items consumed within the past several days, which may cause error or over/under estimation.

## **Chapter 7: Conclusion**

This research identified elements of the Kentucky WIC participant regarding demographics, food purchasing, grain consumption, and beliefs, attitudes, and awareness towards grains. The majority of participants in this research were single, white, post-partum, females in their mid-twenties with one child.

Regarding food purchasing, participants were most concerned with price and nutritional value when buying food. Of the participants, 35.8% responded that they look at the nutrition facts on packaging when purchasing food. Research has found that even persons with relatively extensive experience with whole grains (like nutrition professionals) may have issues using labels to identify whole grain products. The top three nutrients that WIC participants indicated examining on packaging were calories, sugar, and total fat. Dietary fiber was one of the least selected nutrients by WIC participants. The majority of participants indicated that they have purchased whole grains before (81.1%), however half of the participants that responded they were of Hispanic, Latino, or Spanish origin selected that they have not or were not sure. Lastly, after reading a prompt explaining the benefits of consuming whole grains participants were asked if they were now more likely to purchase them, which half of the participants said yes.

Participants were asked how many servings of grains they consume on most days. A prompt preceded this question explaining serving sizes and the recommended amount they should be eating. Although a majority of participants responded yes or sometimes when asked if they would say they eat enough grains in their diet, over half of the participants selected only eating 1-3 servings of grains on most days. For adults,

breakfast cereal, spaghetti, and white bread were the top three selections when participants were asked what grain foods they have had within the past two weeks. For children, breakfast cereal, crackers, and macaroni were the top three selections.

When participants were asked if they were aware of the health benefits they may get from consuming grains every day such as protection from heart disease and diabetes, the majority of participants responded yes. A significant relation was found between participants who are aware of health benefits from consuming grains were to participants who have purchased whole grains before. Slightly more than half of the participants indicated they would say their children eat enough grains. A significant relationship was observed between the parents perception of if they eat enough grains and the perception if their children eat enough grains. Almost all participants indicated that they were aware of the term whole grain, which was found to be significant with having purchased whole grains before, and awareness of whole grain health benefits. When asked if they would like to have more information on the types and benefits of grains, over half of the participants indicated they would not. However, participants that were interested in more information were most interested in receiving a recipe book.

Based on the findings of this research the following may benefit participants:

1. Education on purchasing nutrient-dense foods (especially whole grains) for the best price.
2. Education on whole grain labels, grain types, and how grains may be listed in ingredients.
3. Education on the importance of nutrients such as calories, sugar, total fat, and dietary fiber, with an emphasis on they play a role in health.
4. Education on serving sizes and recommended daily intakes, especially for grains and whole grains.
5. Education on how to get kids to eat whole grains.

Future studies should be examined over a longer period of time and with a much larger sample size. Further research may want to gather information from the WIC participants regarding all of the other food groups in addition to grains.

## Appendix A: Survey

**Please respond to all the questions on the survey that apply to you. Read the instructions for each question and circle the answers that apply. If you have any questions or need assistance please do not hesitate to ask.**

### 1. Are you?

Male          Female

### 2. What age range do you fall in?

Under 16                  30-36  
16-20                      36-40  
21-24                      Over 40  
25-29

### 3. What race/ethnic group best fits you? (Circle all that apply)

American Indian or Alaskan Native  
Asian  
Black, African American, Haitian, or Negro  
Native Hawaiian or Other Pacific Islander  
White  
Other

### 4. Are you Hispanic, Latino, or of Spanish origin?

Yes          No

### 5. What is your marital status?

Single          Married          Divorced          Separated  
Widowed

### 6. Are you the main person who buys food for your household?

Yes                  No

**7. What makes you decide what food to buy the most (Circle one please)**

Price	Nutritional Value	How it Looks	Special Needs
Hunger	Taste	Easy to Make	_____ (Other)

**8. When buying food do you look at the nutrition facts on the packaging?**

Yes                  No                  Sometimes

**9. If you look at the nutrition facts, what are the top three things you look at? (Circle your top 3).**

Serving Size	Calories	Total Fat	Saturated Fat
Trans Fat	Cholesterol	Sodium	Potassium
Carbohydrates	Dietary Fiber	Sugar	Protein
Vitamins/Minerals			

*Grains are an important part of a healthy diet. Examples of grains that you may eat are bread, rice, pasta, and cereal. Most adults need 6-8 servings of grains every day. One slice of bread, 1 cup of cereal, or ½ cup of cooked rice, cooked pasta, or cooked cereal can be considered as 1 serving from the grains group.*

**10. Would you say that you eat enough grains in your diet?**

Yes                  No                  Not Sure

**11. How many servings of grains do you eat on most days?**

None	7-9 Servings
1-3 Servings	10 or More Servings
4-6 Servings	

**12. Did you know that there are health benefits that you can get from eating grains every day, such as protecting your heart and preventing diabetes?**

Yes                  No

**13. Please, circle below what grain foods you have had within the past two weeks.**

White Bread	Whole Wheat Bread	White Rice	Brown Rice
Oatmeal	Spaghetti	Macaroni	Grits
Popcorn	Cornbread	Noodles	
Breakfast Cereal	Do not know	Other (please list)	

**14. Circle what best describes you right now.**

Pregnant      Breastfeeding      Postpartum      N/A

**15. How many children do you have? If none skip to question #18.**

One              Two              Three              Four              Five  
More than Five

**Please list how many children you have in each age group:**

\_\_\_ 0-5 months              \_\_\_ 2 years      \_\_\_ 5 years or older  
\_\_\_ 6-11 months              \_\_\_ 3 years  
\_\_\_ 1 year              \_\_\_ 4 years

**16. Would you say that your children eat enough grains? (If applicable).**

Yes              No              Not Sure

**17. Please, circle below which grain foods your children have had within the past two weeks.**

White Bread	Whole Wheat Bread	White Rice	Brown Rice
Oatmeal	Spaghetti	Macaroni	Grits
Tortilla	Cornbread	Noodles	
Breakfast Cereal	Crackers	Other (please list)	

*Whole grain means that all three parts of the grain are in one piece and have not been refined. When a grain is refined, it loses a lot of its nutritional value. In the grocery store, whole grains are usually labeled as such.*

**18. Were you already aware of the term whole grain?**

Yes              No

**19. Have you bought whole grain foods before?**

Yes              No              Not Sure

*Whole grains can decrease your risk of stroke, diabetes, heart disease, obesity, asthma, high blood pressure, gum disease, and many other issues.*

**20. Many whole grains foods are offered on the WIC program. Knowing that whole grains are a healthier choice for you are you more likely to buy them now if not before?**

Yes              No              Not Sure              Already Buy Whole Grains

**21. Would you like to have more information on the types and benefits of grains?**

Yes

No

**22. If you would like to have more information what would interest you? (Check all that apply).**

Types of whole grains

Facts about specific grains

Benefits of eating whole grains

Posters in the clinic

Recipe book

Classes on grains

Whole grain shopping tips

How to get kids to eat whole grains

References:

1. Flegal, K.M., et al., *Prevalence and trends in obesity among US adults, 1999–2000*. Journal of the American Medical Association, 2002. **288**(14): p.1723–1727.
2. Odgen, C.L., et al., *Prevalence of overweight and obesity in the United States, 1999– 2004*. Journal of the American Medical Association, 2006. **295**(13): p. 1549-1555.
3. Mokdad, A.H., Ford, et al., *Diabetes trends in the U.S.: 1990–1998*. Diabetes Care, 2002. **23**(9): p. 1278–1283.
4. Engelgau, M.M., et al., *The evolving diabetes burden in the United States*. Annals of Internal Medicine, 2004. **140**(11): p. 945–950.
5. Haffner, S.M., et al., *Mortality from coronary heart disease in subjects with type 2 diabetes and in nondiabetic subjects with and without prior myocardial infarction*. New England Journal of Medicine, 1998. **339**(4): p. 229–234.
6. Robert Wood Johnson Foundation. *Partnership for solutions, chronic conditions: making the case for ongoing care*. 2004; Available from: <http://www.partnershipforsolutions.org/DMS/files/chronicbook2004.pdf>.
7. Centers for Disease Control and Prevention. *Leading Causes of Death*. 2012; Available from: Retrieved from: <http://www.cdc.gov/nchs/fastats/lcod.htm>.
8. Anderson, P. M. and Butcher, K. F., *Childhood Obesity: Trends and Potential Cause. The Role of Schools in Obesity Prevention*. The Future of Children, 2006. **16**(1): p. 19-45.
9. Marquart, L., et al., *Beliefs about whole-grain foods by food and nutrition, professionals, health club members, and special supplemental nutrition program for women, infants, and children participants/State fair attendees*. Journal of the American Dietetic Association, 2006. **106**(11): p. 1856-60.
10. United States Department of Agriculture. *What foods are in the grain group?* 2012; Available from: <http://www.choosemyplate.gov/food-groups/grains.html>.
11. United States Department of Agriculture Agricultural Research Service National Agriculture Library. *Nutrient data for 20016, corn meal, whole-grain, yellow*. 2012; Available from: <http://ndb.nal.usda.gov/ndb/foods/show/6327?fg=Cereal+Grains+and+Past&man=&facet=&format=&count=&max=25&offset=&sort=&qlookup=>.

12. Larson, N.I., et al., *Whole-grain intake correlates among adolescents and young adults: findings from Project EAT*. Journal of the American Dietetic Association, 2010. **110**(2): p. 230-237.
13. Food and Nutrition Service. *Women, infants, and children*. 2012; Available from: <http://www.fns.usda.gov/wic/>.
14. Food and Nutrition Service. *Benefits and services: WIC food packages – regulatory requirements for WIC-eligible foods*. 2005; Available from: <http://www.fns.usda.gov/wic/benefitsandservices/foodpkgregs.HTM#WHOLE WHEAT BREAD/WHOLE GRAIN BREAD/OTHER WHOLE GRAINS>.
15. Food and Nutrition Service. *Arkansas WIC program approved food list*. 2010; Available from: <http://www.healthy.arkansas.gov/programsServices/WIC/Documents/Food Lists.PDF>.
16. Food and Nutrition Service. 2011; *Kentucky WIC approved food list*. Available from: <http://chfs.ky.gov/nr/rdonlyres/7959397f-3517-4980-a58a-5e5541b6a6f8/0/foodlist20102011legalsizerevised81210.pdf>.
17. Centers for Disease Control and Prevention. *U.S. obesity trends*. 2012; Available from: <http://www.cdc.gov/obesity/data/trends.HTML>.
18. National Conference of State Legislatures. *Diabetes prevalence county level*. 2010; Available from: <http://www.ncsl.org/issues-research/health/diabetes-prevalence-county-level.aspx>.
19. United States Department of Agriculture Agricultural Research Service National Agriculture Library. *Nutrient data for 20022, corn meal, degermed, enriched, yellow*. 2012; Available from: <http://ndb.nal.usda.gov/ndb/foods/show/6328?fg=Cereal+Grains+and+Past a&man=&lfacet=&format=&count=&max=25&offset=&sort=&qlookup=>.
20. Harlan, J.R., *Crops and Man*, 1992, Madison, WI: ASA, CSA.
21. Ucko, P.J. and Dimbleby, G.W., *The Domestication and Exploitation of Plants and Animals*, 2007, Chicago, IL: Aldine Publishing Co.
22. Eaton, S.B., *Humans, lipids, and evolution*. Lipids, 1992. **27**(10): p. 814-820
23. The University of Nebraska-Lincoln. *Drought in the Dust Bowl years*. 2006; Available from: <http://www.drought.unl.edu/DroughtBasics/DustBowl/DroughtintheDustBowlYears.aspx>.

24. Cook, B.I., et al. *Amplification of the North American “Dust Bowl” drought through human-induced land degradation*. 2009; Available from: <http://www.pnas.org/content/106/13/4997.full>.
25. Ploeg, M. *WIC and the battle against childhood overweight*. 2009; Available from: <http://www.ers.usda.gov/Publications/EB13/>.
26. Centers for Disease Control and Prevention. *Basics about childhood obesity*. 2009; Available from: <http://www.cdc.gov/obesity/childhood/consequences.html>.
27. The Council of State Governments. *Shaping Kentucky’s future*. 2012; Available from: [http://www.csg.org/programs/policyprograms/SCORE/SCORE\\_files/Partnershippolicydocument.pdf.pdf](http://www.csg.org/programs/policyprograms/SCORE/SCORE_files/Partnershippolicydocument.pdf.pdf).
28. Substance Abuse and Mental Health Services Administration. *Teen cigarette use and perceptions of risk*. 2010; Available from: [http://www.samhsa.gov/samhsanewsletter/Volume\\_18\\_Number\\_3/TeenSmoking.aspx](http://www.samhsa.gov/samhsanewsletter/Volume_18_Number_3/TeenSmoking.aspx).
29. Centers for Disease Control and Prevention. *Smoking and tobacco use*. 2012; Available from: [http://www.cdc.gov/tobacco/data\\_statistics/state\\_data/state\\_highlights/2010/states/kentucky/index.htm](http://www.cdc.gov/tobacco/data_statistics/state_data/state_highlights/2010/states/kentucky/index.htm).
30. Kentucky Cabinet for Health and Family Services. *Leading and selected causes of resident deaths, 2005*. 2005; Available from: [http://chfs.ky.gov/NR/rdonlyres/C149F3B7-A67C-459B-921E-948008EE251E/0/2005\\_State\\_County\\_Leading\\_And\\_Selected\\_Causes\\_of\\_Deaths.pdf](http://chfs.ky.gov/NR/rdonlyres/C149F3B7-A67C-459B-921E-948008EE251E/0/2005_State_County_Leading_And_Selected_Causes_of_Deaths.pdf)
31. Centers for Disease Control and Prevention. *National vital statistics report*. 2011; Available from: [http://www.cdc.gov/nchs/data/nvsr/nvsr59/nvsr59\\_04.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr59/nvsr59_04.pdf).
32. Mancino, L., et al., *Getting consumers to eat more whole-grains: The role of policy, information, and food manufacturers*. Food Policy, 2008. **33**(6): p. 489-496.
33. Newby, P.K., et al., *Intake of whole grains, refined grains, and cereal fiber measured with 7-d diet records and associations with risk factors for chronic disease*. American Journal of Clinical Nutrition, 2007. **86**(6): p. 1745-1753.
34. Katcher H., et al., *The effects of a whole grain-enriched hypocaloric diet on cardiovascular disease risk factors in men and women with metabolic syndrome*. American Journal of Clinical Nutrition, 2008. **87**(1): p. 79-90.

35. Melanson, K.J., et al., *Consumption of whole-grain cereals during weight loss: effects on dietary quality, dietary fiber, magnesium, vitamin B-6, and obesity*. J Am Diet Assoc, 2006. **106**(9): p. 1380-1388.
36. Venn, B.J. and Mann, J.I., *Cereal grains, legumes, and diabetes*. European Journal of Clinical Nutrition 2004. **58**(11): p. 1443-61.
37. Centers for Disease Control and Prevention. *National diabetes fact sheet 2011*. 2011; Available from: [http://www.cdc.gov/diabetes/pubs/pdf/ndfs\\_2011.pdf](http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf).
38. Liu, S., et al., *A prospective study of whole grain intake and risk of type 2 diabetes mellitus in US women*. American Journal of Public Health, 2000. **90**(9): p. 1409-1415.
39. Meyer, K.A., et al., *Carbohydrates, dietary fiber, and incident type 2 diabetes in women*. American Journal of Clinical Nutrition, 2000. **71**(4): p. 921-930.
40. Fung, T.T., et al., *Whole grain intake and the risk of type 2 diabetes: a prospective study in men*. American Journal of Clinical Nutrition, 2002. **76**(3): p. 535-540.
41. Montonen, J., et al., *Whole grain and fiber intake and the incidence of type 2 diabetes*. American Journal of Clinical Nutrition, 2003. **77**(3): p. 622-629.
42. Slavin, J.L., et al., *Plausible mechanisms for the protectiveness of whole grains*. American Journal of Clinical Nutrition, 1999. **70**(3): p. 459S-63S.
43. Tabatabai, A. and Li, S., *Dietary fiber and type 2 diabetes*. Clinical Excellence for Nurse Practitioners, 2000. **4**(5): p. 272-276.
44. Cummings, J.H. and Englyst, H.N., *Fermentation in the human large intestine and the available substrates*. American Journal of Clinical Nutrition, 1987. **45**(5): p. 1243-55.
45. Schuzle, M., et al., *Glycemic index, glycemic load, and dietary fiber intake and incidence of type 2 diabetes in younger and middle-aged women*. American Journal of Clinical Nutrition, 2004. **80**(2): p. 348-356.
46. Wannamethee, S.G., et al., *Associations between dietary fiber and inflammation, hepatic function, and risk of type 2 diabetes mellitus in older men: potential mechanisms for the benefits of fiber on diabetes risk*. Diabetes Care, 2009. **23**(10): p.1823-1825.

47. Food and Nutrition Service. *WIC participant and program characteristics*. 2010; Available from: <http://www.fns.usda.gov/ora/menu/published/wic/FILES/pc2008.pdf>.
48. Food and Nutrition Service. *WIC program: total participation*. 2012; Available from: <http://www.fns.usda.gov/pd/27wilatest.htm>.
49. Food and Nutrition Service. *WIC program table II – total racial/ethnic participant enrollment as of April 2008*. 2011; Available from: <http://www.fns.usda.gov/wic/racial-ethnicdata/2008table2.htm>.
50. Food and Nutrition Service. *Diet quality of American young children by WIC participation status: data from the national health and nutrition examination survey, 1999-2004*. 2008; Available from: <http://www.fns.usda.gov/ora/menu/published/wic/FILES/NHANES-WIC.pdf>.
51. Ploeg, M. *WIC and the battle against childhood overweight*. 2009; Available from: <http://www.ers.usda.gov/Publications/EB13/>.
52. Food and Nutrition Service. *How WIC helps*. 2011; Available from: [http://www.fns.usda.gov/wic/aboutwic/howwichelps.htm#birth\\_outcomes](http://www.fns.usda.gov/wic/aboutwic/howwichelps.htm#birth_outcomes).
53. Fung, E., et al., *Randomized, controlled trial to examine the impact of providing yogurt to women enrolled in WIC*. *Journal of Nutrition Education & Behavior*, 2010. **42**(3S): p. S22- S29.
54. Ritchie, L., et al., *Favorable impact of nutrition education on California WIC families*. *Journal Of Nutrition Education & Behavior*, 2010. **42**(3S): p. S2-S10.
55. Anderson, J.V., et al., *5 a day fruit and vegetable intervention improves consumption in a low income population*. *Journal of the American Dietetic Association*, 2011. **101**(2): p. 195-202.
56. Whaley, S.E., et al., *Revised WIC food package improves diets of WIC families*. 2012; Available from: [http://www.jneb.org/article/S1499-4046\(11\)00574-%204/abstract](http://www.jneb.org/article/S1499-4046(11)00574-%204/abstract).
57. United States Department of Agriculture. *The US grain consumption landscape*. 2007; Available from: <http://www.ers.usda.gov/publications/err50/err50.pdf>.
58. Harnack ,L., et al., *Dietary intake and food sources of whole grains among US children and adolescents: data from the 1994-1996 continuing survey of food intakes by individuals*. *Journal of the American Dietetic Association*, 2003. **103**(8): p. 1015-1019.

59. United States Department of Agriculture. *Executive Summary*; Available from: <http://www.cnpp.usda.gov/Publications/DietaryGuidelines/2010/PolicyDoc/PressRelease.pdf>

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