EFFECTIVENESS OF A GROCERY STORE TOUR FOR PARENTS OF WIC CHILDREN WITH LOW SERUM IRON LEVELS

A THESIS
SUBMITTED TO THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE MASTER OF SCIENCE IN DIETETICS

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The purpose of this quasi-experimental study was to measure the effectiveness of a grocery store tour that emphasized sources of iron-rich, kid-friendly foods on the participants’ knowledge about dietary iron and iron-rich food sources. A second purpose was to determine if, three months after the grocery store tour, the serum iron levels of the children who had previously been identified by the WIC (Supplemental Women, Infants, and Children) program as being low was higher as compared to the serum iron levels of the control group. Ten parents of children with low iron levels participated in this study, 5 in the control group and 5 in the treatment group. Data collection took place for this research study over the course of three months. The results of this study indicated that the grocery store intervention seemed to have no impact on the children’s hemoglobin levels. The results of this study also indicated that the grocery store tour intervention seemed to have no impact on children’s consumption of iron rich foods. However, the grocery store tour intervention did have a positive impact on parents’ knowledge of iron rich foods and their ability to use unit pricing.
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CHAPTER 1

INTRODUCTION

According to Healthy People 2010, 15.9% of children ages one to two years old were iron deficient during the years 2005-2008 (U.S. Department of Health and Human Services, 2010). Due to the increasing prevalence of iron deficiency anemia in children, federal and state authorities have made it their goal to reduce this trend in low-income children through programs such as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) (Schneider et al., 2008). WIC is a supplemental nutrition program that provides nutritious foods, nutrition education, and referrals to other health and social services at no charge. WIC serves low-income pregnant, postpartum and breastfeeding women, infants, and children up to the age of five who are at nutritional risk. During the final quarter of 2009, nearly 9.3 million individuals were receiving benefits from WIC each month (U.S. Department of Agriculture [USDA], 2009).

Iron deficiency anemia can occur due to several factors, but the most common cause in infants and toddlers is consuming a diet insufficient in iron (Frantz, 2010). Poverty is another factor that can contribute to iron deficiency. Families that live at or
below the poverty level are at risk for not getting enough iron-rich foods (Skalicky et al., 2006).

One potential way to reduce a child’s risk for iron deficiency anemia may be to teach the family’s primary grocery shopper about sources of iron-rich foods. This education could be shared with the family’s primary grocery shopper by providing a grocery store tour that emphasizes iron-rich foods.

**Problem**

The problem of this study was the prevalence of iron deficiency anemia in older infants and children, particularly low-income. Iron is needed to make hemoglobin (Culvert & Brody, 2006). If there is not enough iron available hemoglobin production will be limited, which, in turn, reduces the production of red blood cells. This decreased amount of hemoglobin and red blood cells is known as anemia. Because red blood cells are needed to carry oxygen throughout the body, anemia causes less oxygen to reach the body’s cells and tissues, which affects their function. Iron deficiency anemia is a serious health condition that can stem from poor eating habits (Frantz, 2010). Older infants and children are at an increased risk for iron deficiency anemia due to their bodies’ increased need for iron (Baker, Greer, & and The Committee on Nutrition, 2010). To reduce a child’s risk for iron-deficiency anemia, it is essential that a family’s primary grocery shopper be knowledgeable about what foods are good sources of iron. The focus of this study was to see if a grocery store tour for parents of WIC children with low iron levels can have a significant impact on the parents’ knowledge of iron-rich foods and, ultimately, on their child’s serum iron levels.

**Purpose**
The purpose of this quasi-experimental study was to measure the effectiveness of a grocery store tour that emphasizes sources of iron-rich, kid-friendly foods on the participants’ knowledge about dietary iron and iron-rich food sources. A second purpose was to determine if, three months after the grocery store tour, the serum iron levels of the children who had previously been identified by the WIC program as being low were higher compared to the serum iron levels of the control group.

**Research Questions**

The following research questions were examined in this study:

RQ#1. Compared to the control group, what is the impact of a grocery store tour given to parents of children previously identified as being anemic on the parents’:

a) knowledge of iron-rich food sources

b) ability to use unit pricing to select inexpensive iron-rich food sources

RQ#2. Compared to the control group, what is the impact of a grocery store tour given to parents of children previously identified as being anemic on their child’s consumption of iron-rich foods?

RQ#3. Compared to the control group, what is the impact of a grocery store tour given to parents of children previously identified as being anemic on the serum hemoglobin levels of the WIC participant previously identified as being anemic three months post-intervention?

**Rationale**
The effects of iron deficiency anemia can be different for every individual. A common symptom is feeling lethargic with a lack of energy. Children are constantly growing and learning. A lack of red blood cells, resulting in the lack of oxygen to the body’s tissues, makes it very difficult for a child to concentrate and physically grow properly (Beard & Connor, 2003). The goal of implementing a grocery store tour for parents of WIC children with low iron levels was to increase their knowledge of iron-rich foods and, ultimately, increase their child’s serum iron levels.

Assumptions

The researcher made the following assumptions in the implementation of the study and in the interpretation of the data:

1. The Competent Professional Authority (CPA) tested the participants’ hemoglobin levels using the WIC approved procedures found in the policies and procedures handbook.

2. A portable hemoglobin meter, consistently and accurately read each participant’s blood sample. The hemoglobin meter is calibrated.

3. Participants would be present to participate at each of the three appointments.

4. The participants paid attention to the grocery store tour.

5. The participants understood and read English.

6. The parent who is the primary grocery shopper participated in the grocery store tour and completed the pre- and post-surveys.

7. The researcher conducted an effective grocery store tour.
8. A CPA would teach each participant who is a member of the control group the normal/typical nutrition education curriculum for iron.

Limitations

The researcher acknowledged the following study limitations:

1. The study was limited to clients who were able to read and speak English.
2. Due to the limited availability of some of the eligible participants, a number of eligible participants were not able to participate in the study.
3. The amount of knowledge a person has and each person’s motivation may vary between the control and treatment groups. However, participants were not asked questions regarding their motivation.
4. The iron levels of children whose parents were participants in this study could be low not due to a diet insufficient in iron but related to a separate medical condition.
5. Because the grocery store tours took place at an actual grocery and not the WIC office, some eligible participants were not able to participate in the study, due to not having reliable transportation to the grocery store.
6. Due to this study consisting of a volunteer sample and the small number of participants in each group, data interpretation and generalization were limited.
7. Limited personal information was obtained from each family. Due to the HIPAA form approved for this study, no demographic information such as ethnicity, education level, employment status, and income was obtained.
8. Information about the children’s iron-rich food intake was based on the participants’ responses to survey questions and would be considered subjective.
CHAPTER 2

REVIEW OF LITERATURE

The purpose of this quasi-experimental study was to measure the effectiveness of a grocery store tour that emphasized sources of iron-rich, kid-friendly foods on the participants’ knowledge about dietary iron and iron-rich food sources. A second purpose was to determine if, three months after the grocery store tour, the serum iron levels of the children who had previously been identified by the WIC program as being low were higher as compared to the serum iron levels of the control group.

Background

During the years 2005 through 2008, 15.9% of children ages one to two years old were iron deficient in the United States, according to Healthy People 2010 (U.S. Department of Health and Human Services, 2010). Due to the increasing prevalence of iron deficiency anemia in children, United States federal and state authorities have made it their goal to reduce this trend in low-income children through programs such as WIC (Schneider, et al., 2008).

Several serious health problems can result from prolonged iron deficiency anemia. Two of the most serious repercussions of this condition in children involve behavioral and learning difficulties (Carter et al., 2010). Children who are anemic may
constantly feel fatigued and sleep more than usual for their age (Brody, 2006). Children who have a lack of red blood cells have a very difficult time concentrating and physically growing properly, due to the lack of oxygen to the body’s tissues (Beard & Connor, 2003). Other behavioral health problems include irritability and lack of attentiveness (Brody, 2006).

**Iron Deficiency Anemia**

Dietary iron is needed to make hemoglobin. Hemoglobin is a protein that is essential for oxygen transport in the body. If there is not an adequate amount of iron available, hemoglobin production is limited. This in turn affects the production of red blood cells (Frantz, 2010). The major function of red blood cells is to carry oxygen to and carbon dioxide away from all of the organs through the bloodstream (Ford-Martin, 2002). A decrease in the amount of hemoglobin and red blood cells in the bloodstream beyond a normal range, which varies due to age and gender, is known as anemia. Iron deficiency anemia is an anemia caused by an iron deficiency (Baker, et. al, 2010). Because red blood cells are needed to carry oxygen throughout the body, anemia results in less oxygen reaching the cells and tissues, affecting their function (Frantz, 2010).

A person progresses through stages of iron deficiency, beginning with iron depletion. During iron depletion, the amount of iron in the body is reduced while the iron in red blood cells remains unchanged. If iron depletion is not corrected, a person’s iron status progresses to iron deficiency. Over time, this condition leads to iron deficiency anemia (Frantz, 2010). Iron deficiency anemia is defined by age-and gender-specific cutoff values based on the fifth percentile from the third National Health and Nutrition Examination Survey for a Healthy Population ("Recommendations to prevent and control
Iron deficiency in the United States. Centers for Disease Control and Prevention," 1998). However, according to the Centers for Disease Control, children ages one to two years are considered anemic if their hemoglobin concentration is less than 11.0 g/dL or their hematocrit level is less than 33.0%. Children aged two to five are considered anemic if their hemoglobin concentration is less than 11.1 g/dL or their hematocrit level is less than 33.3%. (Centers for Disease Control and Prevention, 2009). Infants, nine months and older, are considered anemic if their hemoglobin is less than or equal to 10.9 g/dL or their hematocrit is less than or equal to 32.8% (U.S. Department of Agriculture [USDA], 2009). There are several causes of iron deficiency anemia in children. Iron deficiency anemia can be attributed to diets low in iron, body changes resulting in an increased need for iron, gastrointestinal tract abnormalities, and blood loss. Approximately one milligram (mg) of iron is absorbed for every 10-20 mg of iron ingested. Due to the fact that such a small amount of dietary iron is absorbed during the digestion process, a diet rich in iron is important to avoid iron deficiency anemia. Children who have a diet lacking in iron rich foods may develop iron deficiency anemia (Annibale et al., 2001). Children’s bodies are constantly growing and changing. These constant growth spurts force infants and children to have an increased need for iron, and to experience an increase in red blood cell production. Malabsorption and digestion issues in the gastrointestinal tract can also affect the absorption and utilizations of iron, potentially leading to iron deficiency anemia. Most of the iron consumed is absorbed in the upper small intestine, so a person suffering from a condition affecting the small intestine may be at risk of developing iron deficiency anemia. Finally, another cause of
iron deficiency anemia can be blood loss. A loss of blood, such as gastrointestinal bleeding, can cause a decrease in the body’s iron stores (Culvert & Brody, 2006).

The most common signs and symptoms of iron deficiency anemia in children include, but are not limited to, behavioral problems, repeated infections, loss of appetite, lethargy, shortness of breath, increased swelling, failure to grow at expected rate based on growth charts, and possible cravings of non-food items (Brody, 2006). Other signs of iron deficiency anemia are dizziness, headache, coldness in hands or feet, and pale skin or nail beds. If the body does not have enough hemoglobin-carrying red blood cells, the heart is forced to work harder to circulate the reduced amount of oxygen in the blood. Over time, this constant strain on the circulatory system can lead to heart arrhythmias, heart murmurs, an enlarged heart, or heart failure (Culvert & Brody, 2006). In infants, iron deficiency anemia has been associated with reduced mental and motor test scores and behavioral changes, such as being more wary and hesitant (Hunt, 2005).

The amount of iron available from each food is partially determined by whether the iron is found in the form of heme or non-heme iron. Heme iron is found only in meat sources and is absorbed much more easily than non-heme iron, which is found typically in beans, vegetables, fruits, and grain products (Whittaker, 2008). Foods containing heme iron are the best sources for increasing or maintaining healthy iron levels. Foods rich in heme iron are beef, organ meats, pork, chicken, cod, and oysters. Foods rich in non-heme iron are black beans, kidney beans, and soybeans, lentils, eggs, and dark green leafy vegetables. Non-heme iron is also found in iron-fortified cereals, nuts, and seeds (Hunt, 2005).
Several factors may positively or negatively affect a person’s ability to absorb iron. For example, there are several nutrient interactions that have the potential to increase or decrease a person’s absorption of iron (Considine, 2005). People with a low iron status will absorb more iron than individuals with adequate stores. There are several diet techniques to improve iron absorption. First, eating foods rich in vitamin C during the same meal or snack as an iron source increases the body’s ability to absorb iron. Some examples of vitamin C rich foods include tomatoes, potatoes, dark green leafy vegetables, peaches, and fruit juices (Anderson & Fitzgerald, 2010). A second way to increase iron absorption is to include a source of heme iron, such as beef, at the same meal as the non-heme source. This will increase the total amount of iron being consumed and the percentage of non-heme iron absorbed will be greater. Third, cooking iron rich vegetables in water before consumption may increase the percentage of iron available for absorption (Considine, 2005).

There are a number of factors that may decrease iron absorption. Coffee, tea, and wine consumption at the same meal or snack as an iron rich food will decrease the amount absorbed as these beverages bind to the iron in the food and carry it out of the body (Considine, 2005). Oxalates, which are compounds derived from oxalic acid, impair the absorption of non-heme iron. Foods such as chocolate, tea, wheat bran, and spinach fall into this category. Despite the fact that spinach is an iron-rich food, the oxalates in spinach prevent the iron from being absorbed. Polyphenols also inhibit the absorption of iron. Polyphenols or pheholic compounds include chlorogenic acid, which is found in coffee and cocoa. Coffee contains a high amount of tannin and chlorogenic acid. In fact, one cup of certain types of coffee can inhibit iron absorption by as much as 60%
Soy protein and fiber are both composed of the compound phytate. Phytate is found in walnuts, sesame, dried beans, lentils, peas, cereals, and whole grains. Phytate compounds have the ability to reduce iron absorption by 50-65%.

In addition, consuming an excessive amount of calcium can decrease the amount of iron absorbed. Research shows that most dietary factors influencing iron absorption more than likely exert their action within the gastrointestinal lumen by making iron more or less bioavailable for absorption. However, calcium has a different effect on the absorption of iron. The way calcium inhibits iron absorption is the same for non-heme and heme iron. Heme and non-heme iron are absorbed by different receptors on the mucosal surface of the intestines, which means the inhibition by calcium must be located within the mucosal cell at some transfer step common to the two kinds of iron. Research shows that there is no effect of calcium on iron absorption when less than 40mg of calcium is present in a meal. No further inhibition is found to be present until the calcium content of the meal exceeds 300mg (Hallberg, 1998). Consequently, iron supplements should never be taken at the same time as calcium supplements nor should they be taken with milk in order to adequately absorb heme and non-heme iron (Ford-Martin, 2002).

Infants six months to twelve months of age need 11 mg of iron per day (Baker, et al., 2010). The American Academy of Pediatrics recommends infants should start being introduced to solid foods, red meat and iron-rich vegetables around six months of age (Baker, et al., 2010). If an infant’s iron needs are not being met by formula and complementary foods, liquid iron supplements may be used. The American Academy of Pediatrics recommends children between one to three years of age need seven mg of iron
per day if at all possible from food, but if needed, liquid or chewable supplements can be used (Baker, et. al, 2010).

**Women, Infants, and Children**

WIC is a supplemental nutrition program funded by the federal government that provides nutritious foods, nutrition education, health care referrals, and breastfeeding support for low-income pregnant, breastfeeding, non-breastfeeding postpartum women, infants, and children up to the age of five who are found to be at nutritional risk. The goals of WIC are: to improve the outcome of high risk pregnancies; to decrease the incidence of anemia and poor growth patterns; to improve the dietary habits of its recipients through healthy foods and nutrition education; and to refer to other health services as appropriate (U.S. Department of Agriculture [USDA], 2009). The WIC program was established in 1972 in response to the high rate of malnutrition among low-income infants and children. Anemia is an indicator of malnutrition, and has been and is still used as a nutritional risk criterion to determine eligibility for WIC benefits.

The decrease in the prevalence of anemia among WIC participants is used as a measure of the program’s success. Over the course of the past 30 years, breastfeeding rates have increased, the use of iron-fortified formulas and cereals has become a standard practice, and cow’s milk has been introduced at older ages. These nutrition education principles are encouraged and taught to families who are receiving WIC benefits in agencies across the United States. All of these actions have significantly reduced the rates and severity of iron deficiency anemia in low-income infants and toddlers (Bogen & Whitaker, 2002).
Iron deficiency is a preventable public health problem (U.S. Department of Health and Human Services, 2010). WIC, a public nutrition program, screens all applicants who may be at risk for iron deficiency anemia (Schneider, et. al, 2008). Individuals found to be at risk for anemia receive nutrition education and vouchers for iron rich foods to help them lower their risk of iron deficiency. Federal guidelines require that all applicants have an iron check, via blood test, that is documented at certification. Infants, ages 0-12 months, are certified as eligible for WIC once and are to have blood work once, between the ages of nine and twelve months of age. Children, ages 1 up to 5, are certified every six months, and are to have their iron check at least once a year. There is a 45-day window of time prior to the certification end date that a participant may be recertified for special circumstances; participation in a study would be an example. If a hemoglobin or hematocrit value is low, iron is rechecked at the next certification (U.S. Department of Agriculture [USDA], 2009).

According to the Centers for Disease Control, children ages one to two years are considered anemic if their hemoglobin concentration is less than 11.0 g/dL or their hematocrit level is less than 33.0%. Children aged two to five are considered anemic if their hemoglobin concentration is less than 11.1 g/dL or their hematocrit level is less than 33.3%. (Centers for Disease Control and Prevention, 2009). Infants, nine months and older, are considered anemic if their hemoglobin is less than or equal to 10.9 g/dL or their hematocrit is less than or equal to 32.8% (U.S. Department of Agriculture [USDA], 2009).

WIC is a federal grant program. Congress authorizes a specific amount of money each year for the program, which is different from an entitlement program. An
entitlement program is one for which Congress sets aside funds to allow every eligible individual in the country to participate in the program. The Food & Nutrition Service branch of the USDA administers WIC at the federal level. WIC is administered by 90 state agencies. This program operates through 1900 local agencies in 10,000 clinic sites, in fifty state health departments, thirty-four Indian Tribal Organizations, the District of Columbia, and five territories. A few examples of where WIC services are provided are county health departments, mobile clinics, hospitals, and schools (United States Department of Agriculture, 2012b).

The Food and Nutrition Service within the USDA produces reports on WIC participants and program statistics. This Food and Nutrition Service report found that the average age of WIC women was 25.5 years old. Forty-two percent of WIC participants self-identify as White, while 45% of WIC participants are Hispanic/Latino. One-fifth of WIC participants are African American. Sixty-seven percent of WIC participants have a high school education or less. Sixty-seven percent of WIC participants reported of receiving food assistance from other food programs. Sixty-four percent of children in WIC families receive health insurance through Medicaid. Seventeen percent of WIC participants report having low or very low food security (United States Department of Agriculture, 2012a).

In the 2010 fiscal year, the Indiana WIC program spent $75,139,432 serving 174,119 participants. The participants were served at the 145 WIC clinics throughout the state. Over half of the Indiana WIC participants are children, ages 1 to 5. In 2010, 5,065 people participated in the Delaware County WIC program. Indiana’s WIC enrollment and national enrollment numbers are rising. (Indiana State Department of Health, 2011).
Nutrition Education and Iron Deficiency Anemia

(Venkateswaran R, A. E. Eyler, & Gorenflo, 1998) evaluated the nutritional knowledge and feeding practices at a WIC center in Ann Arbor, Michigan. All mothers of children participating in the WIC program received basic information regarding the importance of iron to developing children and sources of iron-rich foods, as well as prenatal and parenting education on an as-needed basis. An initial iron-deficiency prevalence assessment was conducted by obtaining data regarding regional population iron deficiency from the state of Michigan’s records. These data were compared with the study’s population lab results. WIC defines a low hemoglobin level as being less than 11.2 g/dL for children under the age of five years. Children with low hemoglobin levels were cross-referenced with regional WIC records and analyzed for demographic information, breastfeeding practices, formula-feeding practices, past history of low hemoglobin status, and any iron-deficiency nutritional education sessions performed. Standardized nutrition interviews were conducted following the assessment of iron-deficiency prevalence. Results indicated that, despite the proven benefit of the WIC program in reducing the prevalence of anemia in children of low-income families, no significant benefit from documented WIC education regarding iron was detected. Anemia was positively associated with being of African American descent (p = 0.05). The researchers concluded that WIC participants who have high-risk conditions may not experience the full benefit of the organization, and additional interventions are needed.

Prevalence of Iron Deficiency Anemia

Carter and colleagues (2010) examined the effects of iron deficiency anemia on certain domains of infant cognitive function and the role of iron deficiency anemia-
related socioemotional deficits in mediating and moderating these effects. Subjects were recruited at an inner-city clinic during the infants’ routine nine-month visit. In this study, iron deficiency anemia (IDA) was defined as a hemoglobin level lower than 11.0 g/dL and above or equal to two. At the infants’ nine and twelve month visits, the Fagan Test of Infant Intelligence (FTII), A-not-B task, a survey that evaluated one’s emotionality, activity, sociability, and temperament, and the Behavior Rating Scale were administered. The results showed that 28 of the participants met this study’s standards for having IDA. Twenty-eight infants were diagnosed with nonanemic iron deficiency (NA ID), and 21 of the participants had normal sufficient iron levels. The researchers came to the conclusion that there was indeed a linear effect for object permanence in infants at nine months. Infants who had insufficient iron levels, IDA, were the most unlikely to exhibit object permanence. Infants who were suffering from NA ID were not as likely to grasp this concept. The infants with sufficient iron levels were the most likely to exhibit this trait. When comparing the results from the FTII test, participants with IDA and having a hemoglobin level lower than or equal to 10.5g/dL portrayed poorer recognition memory than the infants without IDA. The Behavior Rating Scale also displayed very similar results. The first year of life is such a critical time for infants. They are progressing through several milestones that set the stage for normal healthy development. The results of this study showed that infants suffering from IDA might not be hitting certain milestones as quickly as infants with sufficient iron levels (Carter, et al., 2010).

Schneider and colleagues (2008) conducted a study to evaluate the risk factors associated with anemia and iron deficiency in a sample of 498 children between the ages of 12-36 months who were recruited from WIC clinics in California. The authors
examined the impact of age, sex, maternal WIC participation during pregnancy, current maternal pregnancy, urban location, and juice intake (orange and tomato) on the incidence of anemia. Multiple logistic regression indicated younger children were more likely to be iron deficient, with boys more likely than girls to be iron deficient. Children with pregnant mothers were significantly more likely to be iron deficient than were children whose mothers did not report being pregnant. Children who lived in urban areas were less likely than were children living in rural areas to be iron deficient. Children who were iron deficient consumed significantly less fruit juice per day (47+/−97 mL/d) than children who were iron sufficient (95+/−176 mL/d; \( p = 0.022 \), Mann-Whitney \( U \) test). The prevalence of anemia was greater in children before enrollment in the WIC program than in those already enrolled. The researchers concluded that current WIC participation by the child and maternal WIC participant during pregnancy were negatively associated with anemia and iron deficiency.

**Grocery Store Tours**

The idea of offering grocery store tours has become popular in the last few years. ConAgra Foods Foundation sponsored the creation of the Share Our Strength’s Cooking Matters program and is supported by the Walmart Foundation. The program was made for WIC families with a goal of empowering families with the skills, knowledge, and confidence they need to prepare healthy, affordable meals. This program contains six cooking-based nutrition education courses with the hope of teaching participants that nutritious cooking can be affordable, enjoyable, and delicious. Individuals in the nutrition and health professions such as dietitians, culinary professionals, and nutrition educators facilitate the grocery store tours (Share Our Strength, 2011). Unfortunately, due to the
recent development of this program, there are no reported data at this time. Also, there has not been an assessment survey developed for this program at this time. Without an assessment survey testing the effectiveness of this program, no data other than participation numbers can be collected.

**Summary**

Iron deficiency anemia is a serious health condition that has a number of adverse health effects if left untreated. Iron deficiency anemia can stem from several causes. However, a diet lacking in iron rich food sources and living in poverty are the two most common reasons in young children. Organizations such as WIC have made it their goal to decrease the prevalence of iron deficiency in children in low-income families. WIC has made a positive effect on the rates of children with iron deficiency anemia by providing nutritious food, nutrition education, and referrals to other health services. ConAgra Foods Foundation sponsored the creation of Share Our Strengths Cooking Matters program, which is a program for WIC families. However, due to the special population of people WIC serves, there is a need for additional nutrition education interventions focusing on the consumption of iron-rich foods.
CHAPTER 3

METHODOLOGY

The purpose of this quasi-experimental study was to measure the effectiveness of a grocery store tour that emphasized sources of iron-rich, kid-friendly foods on the participants’ knowledge about dietary iron and iron-rich food sources. A second purpose was to determine if, three months after the grocery store tour, the serum iron levels of the children who had previously been identified by the WIC program as being low were higher as compared to the serum iron levels of the control group. This chapter will describe the methods used to conduct the study.

Institutional Review Board

The Institutional Review Board at Ball State University approved this study on November 30, 2011 (Appendix I-1). The primary researcher as well as other members of the research team conducting this analysis completed the Collaborative Institutional Training Initiative (Appendix I-2).

Subjects

The subjects for this study were ten parents of WIC children who had been identified with low iron levels (e.g., serum hemoglobin less than 11.0 mg/dL) at their 18-month certification. There were five parents in the control group (e.g., parents who chose not to participate in the grocery store tour, but consented to release their child’s
hemoglobin levels and completed the iron knowledge survey) and five parents in the treatment group (e.g., parents who agreed to take part in the grocery store tour and complete the iron knowledge survey).

**Sampling**

All children receiving WIC benefits must be certified every six months, as a part of WIC policy. In between the six-month certification periods, each participant must attend a nutrition education contact, performed at the WIC clinic. After the education contact, they are then able to sign for the next three months of checks. These checks may be used at the grocery store. Children who participate in the WIC program must have their hemoglobin level checked at their 18-month certification appointment. The parents who were eligible for this study needed to have children who received a low hemoglobin reading at 18-months (the certification between their one year and two year birthday). The participants for this study were acquired by the use of a volunteer sample recruitment process. The researcher did not obtain participants through random sampling.

Every Monday for a month, the researcher called the parents of children who received a low hemoglobin reading at their 18-month certification appointment and who had a nutrition education and check pick-up appointment the upcoming week. The researcher asked for the parents’ participation in the research study. Each eligible participant received information about the purpose, methods, possible benefits, and the compensation from full participation in the study. Participants were collected on a first come first serve basis. The researcher called the eligible participants in the order of their appointment times and days that week. Eligible participants were called each week until both control and treatment group had a total of 10 participants. If they declined to
participate in the grocery store tour, but agreed to release their child’s hemoglobin levels and agreed to complete the pre/post assessment survey then they became a member of the control group. If the parent agreed to participate in the complete study that participant was a member of the treatment group.

**Methods Post-Sampling**

**Control Group**

The control group was asked to sign the control group consent form (Appendix II-1) at their child’s upcoming WIC appointment. At this WIC appointment, the control group participants were also asked to complete the pre-assessment (Appendix-III), and given a nutrition education handout emphasizing iron rich foods (Appendix IV).

**Treatment Group**

If the parent agreed to participate in the complete study they were asked to attend the grocery store tour, which was given later that week. In addition to the grocery store tour, the treatment group parents still came to their WIC appointment that week for a nutrition contact and to pick up checks. At the grocery store tour, each parent/participant signed a treatment group consent form (Appendix II-2), completed the pre-grocery store tour assessment (Appendix II), attended the 30 minute grocery store tour, took a post grocery store knowledge assessment, and received the same educational handout emphasizing iron rich foods as the control group received. This intervention took place at the Marsh grocery store located on Hoyt Street in Muncie, Indiana, store #329. Participants met the tour guide in the front of the store. The 30-minute grocery store tour emphasized how to identify kid-friendly, iron-rich foods and how to use unit pricing to
select inexpensive iron-rich food sources. An outline of the grocery store tour can be found in Appendix V.

**Six Month Follow Up and Final Phase of Data Collection**

Every six months, a child participating in WIC needs to be certified, verifying their eligibility for the program. Following the initial meeting with the treatment and control groups, participants brought their child to their next WIC appointment when the child was approximately 24 months old. This appointment was also the final data collection appointment of this study. At this concluding visit, parents of both the control group and the treatment group were asked to complete the post-grocery store tour assessment (Appendix III-1). Their child’s iron levels were tested as part of the standard certification WIC protocol. At this final visit, the treatment group participants received a $10 Marsh gift card as an incentive for participating in the complete study.

**Instruments**

**Hemoglobin.** All participating children had their hemoglobin tested at their 18 month and 24 month WIC appointments. A WIC CPA performed the hemoglobin screenings at each visit using a hemoglobin meter. The CPA tested the child’s hemoglobin levels using the WIC approved procedures found in the policies and procedures handbook. A low hemoglobin reading for children ages one to two is a reading below 11.0g/dL (Center for Disease Control and Prevention, 2009).

**Participants Nutrition Knowledge and Child’s Eating Habits.** Due to the lack of a preexisting assessment tool that evaluated both the participants’ knowledge of iron-rich foods sources and their child’s eating habits, a pre/post assessment instrument was developed by the researcher (Appendix III-1). According to the procedures recommended
by a team of researchers at Ball State University, the researcher gathered a team of six juror members to validate the assessment instrument (McKenzie, Wood, Kotecki, Clark J. K., & Brey, 1999). Each juror member was selected to participate because of their work, knowledge, and interest in the field of dietetics and nutrition education. Each juror member either held a Masters or PhD in Dietetics and/or was a Registered Dietitian.

Participation in this process included two reviews, one qualitative and one quantitative, of the draft instrument. Each juror member received a letter requesting his or her participation. This letter also explained their tasks, thanked them for their participation, and gave a due date for their work. The first step was the qualitative review in which the researcher took the juror members’ ideas and thoughts about each of the eleven assessment questions. After the researcher edited the assessment questions accordingly, they were then re-sent to each of the juror members for the quantitative review. The quantitative review consisted of each of the juror members rating each question on its appropriateness by stating if it was essential, useful but not essential, or not necessary.

After the return of each juror’s rating, the researcher added the responses of each question and then calculated the content validity ratio (CVR). The CVRs were then compared to the levels necessary for statistical significant at p<.05. If the CVRs did not reach the minimal levels noted for the appropriate number of jurors, then the question was to be dropped from the assessment instrument. According to the Ball State researchers’ calculations, in this study the minimal CVR value was .99, due to such a small number of jurors participating. In essence, .99 was the minimum value of the content validity ratio for significance at p<. 05. Even though two out of the eleven assessment questions did not attain a minimum value of .99, the researcher felt that these
questions were vital for achieving the participants’ full knowledge of iron and iron deficiency anemia (McKenzie, et. al, 1999).

Throughout the course of this three month research study, each participant completed the iron assessment survey a minimum of two times, once at the initial visit and once at the final certification appointment, which was also the final data collection time. However, participants in the treatment group completed the assessment survey one other time, immediately after they completed the grocery store tour.

**Timelines**

A timeline was created describing the sequence and frequency of appointments and events that take place at the various appointments for WIC children (Appendix VII). Another timeline was created pinpointing in detail what “paperwork” was completed and data were collected from the research participants at the three data collection points. This timeline can be seen in Table 1.
Table 1. 
Data Collection Timeline

<table>
<thead>
<tr>
<th></th>
<th>Data Collection 1 (WIC Office) Week 1</th>
<th>Data Collection 2 (Grocery Store) Week 1</th>
<th>Data Collection 3 (WIC Office) Week 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Group</td>
<td>• Adult participants:</td>
<td>• Adult participants:</td>
<td>• Adult participants:</td>
</tr>
<tr>
<td></td>
<td>o signed consent form</td>
<td>o completed iron knowledge survey</td>
<td>o completed iron knowledge survey</td>
</tr>
<tr>
<td></td>
<td>o completed HIPAA form</td>
<td></td>
<td>o completed iron knowledge survey</td>
</tr>
<tr>
<td></td>
<td>o completed iron knowledge survey</td>
<td></td>
<td>o completed iron knowledge survey</td>
</tr>
<tr>
<td></td>
<td>o issued iron information</td>
<td></td>
<td>o completed iron knowledge survey</td>
</tr>
<tr>
<td></td>
<td>o handout</td>
<td></td>
<td>o completed iron knowledge survey</td>
</tr>
<tr>
<td></td>
<td>• Children hemoglobin level</td>
<td></td>
<td>• Children hemoglobin level</td>
</tr>
<tr>
<td>Treatment Group</td>
<td>• Adult participants:</td>
<td>• Adult participants:</td>
<td>• Adult participants:</td>
</tr>
<tr>
<td></td>
<td>o signed consent form</td>
<td>o completed iron knowledge survey</td>
<td>o completed iron knowledge survey</td>
</tr>
<tr>
<td></td>
<td>o completed HIPAA form</td>
<td></td>
<td>o completed iron knowledge survey</td>
</tr>
<tr>
<td></td>
<td>o completed iron knowledge survey</td>
<td></td>
<td>o completed iron knowledge survey</td>
</tr>
<tr>
<td></td>
<td>o issued iron information</td>
<td></td>
<td>o completed iron knowledge survey</td>
</tr>
<tr>
<td></td>
<td>o handout</td>
<td></td>
<td>o completed iron knowledge survey</td>
</tr>
<tr>
<td></td>
<td>• Children hemoglobin level</td>
<td></td>
<td>• Children hemoglobin level</td>
</tr>
</tbody>
</table>

Letter of Permission
A letter of permission (Appendix V1-1) was submitted to the Delaware County WIC coordinator, Leanna Cole, to obtain permission to conduct this study. A letter from the Delaware County WIC Coordinator was received granting permission to conduct this study. (Appendix V1-2).

Letter of Consent
Each participant signed a letter of consent. Each member of the control group signed a copy of the consent form found in Appendix II-1, and each member of the treatment group signed a copy of the consent form found in Appendix II-2.

**Data Analysis**

Data were entered into an Excel spreadsheet and uploaded into SPSS v.19.0 for Windows (SPSS, 2011) for analysis. Due to the small number of participants in this study, descriptive statistics was the most effective method for analyzing and presenting the data. Descriptive statistics and frequency counts were run on the knowledge based questions (1, 2, 3, 4, 6, 7, 10), behavioral questions (5, 8, 9), and the barriers to purchasing healthy foods (question 11). Descriptive statistics were run on the hemoglobin levels (pre- and post-intervention). Due to the treatment group participants completing three assessment surveys (pre-, post-intervention, and 3 months post-intervention), descriptive statistics and frequency counts were run on all three surveys. For the purpose of providing a statistical indicator of differences, although the sample size was small, a one-tail t-test was utilized to compare means of the pre- and post-survey results.

**Summary**

The participants for this study were acquired by the use of a volunteer sample recruitment process. Due to the lack of a preexisting assessment tool that evaluated both the participants’ knowledge of iron-rich foods sources and their child’s eating habits, a pre/post assessment instrument was developed by the researcher (Appendix III-1). Data collection took place for this quantitative research study over the course of three months. Each participant attended two to three data collection appointments, depending on which group they were in. After data collection, a data analysis was completed comparing the
treatment group with the control group’s hemoglobin levels and nutrition knowledge regarding iron, pre- and post-intervention.
CHAPTER 4

RESULTS

The purpose of this quasi-experimental study was to measure the effectiveness of a grocery store tour that emphasized sources of iron-rich, kid-friendly foods on the participants’ knowledge about dietary iron and iron-rich food sources. A second purpose was to determine if, three months after the grocery store tour, the serum iron levels of the children who had previously been identified by the WIC program as being low were higher as compared to the serum iron levels of the control group. This chapter will present the results of the data analysis.

Subjects

The subjects for this study were ten parents of WIC children who had been identified with low iron levels (e.g., serum hemoglobin less than 11.0 mg/dL) at their 18-month certification. There were 5 parents in the control group (e.g., parents who chose not to participate in the grocery store tour, but consented to release their child’s hemoglobin levels and completed the iron knowledge survey) and 5 parents in the treatment group (e.g., parents who agreed to take part in the grocery store tour and complete the iron knowledge survey). Demographic data on participants were not available for research. The HIPAA form approved for this study only allowed the release
of participants’ iron knowledge assessment survey scores and children’s hemoglobin levels.

**Research Question #1**

Compared to the control group, what is the impact of a grocery store tour given to parents of children previously identified as being anemic on the parents’ knowledge or iron-rich food sources and ability to use unit pricing to select inexpensive iron-rich food sources. The same seven knowledge questions were included on all three of the surveys. The treatment group’s average score on the pre-treatment assessment survey when looking at the knowledge based questions was 4.40 out of 7. After participating in the grocery store tour the mean score of the assessment survey was 6.60 out of 7, a 50% increase which was statistically significant (p<.05) when a paired t-test was calculated. Three months later at the children’s certification appointments, which were also the final data collection points, the mean score for the nutrition knowledge portion of the assessment survey was 5.20. This was a 21% decrease when compared to the assessment survey mean that was collected immediately after the treatment. Although this mean of 5.20 was still higher than the original nutrition knowledge average of 4.40, the difference was not statistically significant (p>.05). The control group’s average score on the knowledge portion of the pre-treatment assessment survey was 3.0. Three months later at the children’s certification appointments, the mean score was 3.8, a 27% increase. The control group’s mean of 4.40 was still lower than the treatment group’s mean of 5.20 on the assessment survey given 3 months post-intervention. These results can be seen in Table 2.
Table 2. *Nutrition Knowledge Results Pre, Post, and 3 Months Later*

<table>
<thead>
<tr>
<th>Subject group</th>
<th>N</th>
<th>Pre mean</th>
<th>Post mean</th>
<th>3 months post mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>5</td>
<td>4.40</td>
<td>6.60</td>
<td>5.20</td>
</tr>
<tr>
<td>Control</td>
<td>5</td>
<td>3.00</td>
<td></td>
<td>3.80</td>
</tr>
</tbody>
</table>

**Research Question #2**

The second research question examined in this study looked at the impact of a grocery store tour given to parents of children previously identified as being anemic on their child’s consumption of iron-rich foods, when compared to the control group. Two questions in the pre- and 3 month post-intervention assessment surveys evaluated the consumption of iron rich foods. Throughout the grocery store tour, the researcher emphasized which foods are good sources of iron. The researcher also explained that some foods contain more iron than others. Question 8 on the pre- and 3 month post-intervention survey asked participants, “How often does your child eat: beef, pork, eggs, chicken, or beans?” Participants had the choice of checking less than once a week, 1-2 times per week, 3-4 times per week, or daily for each of the five foods. Out of these five foods, beef contains the most iron or best iron (heme iron), followed by beans. These two foods were emphasized throughout the grocery store tour intervention. The post-intervention survey results showed that, according to the participants, the children in the treatment group did not consume these two foods more often as a group than they did prior to the grocery store tour. The individual break up of each food item consumption frequency can be seen below.
Table 3.  
*Question 8A: How Often Does Your Child Eat Beef?*

<table>
<thead>
<tr>
<th>Survey Test</th>
<th>Less than once a wk</th>
<th>1-2 times/wk</th>
<th>3-4 times/wk</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Survey</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Group</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Control Group</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Post Survey</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Group</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Control Group</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 1. How Often Does Your Child Eat Beef?
Table 4. *Question 8B: How Often Does Your Child Eat Pork?*

<table>
<thead>
<tr>
<th>Survey Test</th>
<th>Less than once a wk</th>
<th>1-2 times/wk</th>
<th>3-4 times/wk</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Survey</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Group</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Control Group</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Post Survey</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Group</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Control Group</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 5. *Question 8C: How Often Does Your Child Eat Eggs?*

<table>
<thead>
<tr>
<th>Survey Test</th>
<th>Less than once a wk</th>
<th>1-2 times/wk</th>
<th>3-4 times/wk</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Survey</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Group</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Control Group</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Post Survey</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment Group</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Control Group</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 6.  
*Question 8D: How Often Does Your Child Eat Chicken?*

<table>
<thead>
<tr>
<th>Survey Test</th>
<th>Less than once a wk</th>
<th>1-2 times/wk</th>
<th>3-4 times/wk</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Survey</td>
<td>Treatment Group</td>
<td>0</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Post Survey</td>
<td>Treatment Group</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 7.  
*Question 8E: How Often Does Your Child Eat Beans?*

<table>
<thead>
<tr>
<th>Survey Test</th>
<th>Less than once a wk</th>
<th>1-2 times/wk</th>
<th>3-4 times/wk</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Survey</td>
<td>Treatment Group</td>
<td>1</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Post Survey</td>
<td>Treatment Group</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
Question 9 asked participants, “How often does your child eat: Frosted Mini Wheats, Multi Grain Cheerios, Kix, or Quaker Oatmeal?” Participants had the choice of checking less than once a week, 1-2 times per week, 3-4 times per week, or daily for each of the four foods. Out of the four foods Multi Grain Cheerios and Frosted Mini Wheats contain the most iron, and these two cereals were emphasized during the grocery store tour. The post-intervention survey results showed that, according to the participants, the children in the treatment group did not consume these two kinds of cereal more often as a group than they did prior to the grocery store tour. The individual break up of each food item consumption frequency can be seen below.
Table 8.
Question 9A: How Often Does Your Child Eat Frosted Mini Wheats?

<table>
<thead>
<tr>
<th>Survey Test</th>
<th>Less than once a wk</th>
<th>1-2 times/wk</th>
<th>3-4 times/wk</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Survey</td>
<td>Treatment Group</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Post Survey</td>
<td>Treatment Group</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 3. How Often Does Your Child Eat Frosted Mini Wheats?
Table 9. Question 9B: How Often Does Your Child Eat Multi Grain Cheerios?

<table>
<thead>
<tr>
<th>Survey Test</th>
<th>Less than once a wk</th>
<th>1-2 times/wk</th>
<th>3-4 times/wk</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Survey</td>
<td>Treatment Group</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Post Survey</td>
<td>Treatment Group</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 4. How Often Does Your Child Eat Multi-Grain Cheerios?
Table 10.

*Question 9C: How Often Does Your Child Eat Kix?*

<table>
<thead>
<tr>
<th>Survey Test</th>
<th>Treatment Group</th>
<th>Less than once a wk</th>
<th>1-2 times/wk</th>
<th>3-4 times/wk</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Survey</td>
<td>Treatment Group</td>
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<td>2</td>
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<td>0</td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Post Survey</td>
<td>Treatment Group</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 11.

*Question 9D: How Often Does Your Child Eat Quaker Oatmeal?*

<table>
<thead>
<tr>
<th>Survey Test</th>
<th>Treatment Group</th>
<th>Less than once a wk</th>
<th>1-2 times/wk</th>
<th>3-4 times/wk</th>
<th>Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Survey</td>
<td>Treatment Group</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Post Survey</td>
<td>Treatment Group</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Control Group</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

**Research Question #3**

The third research question examined in this study looked at the impact of a grocery store tour given to parents of children previously identified as being anemic on their serum hemoglobin levels three months post-intervention. The average hemoglobin level of the treatment group pre-intervention, was 10.2 g/dL and post-intervention was 10.0 g/dL. The average hemoglobin level of the control group pre-intervention was 10.64
g/dL and post-intervention was 11.5 g/dL. These changes in the average means can be seen in Table 11.

Table 12. *Hemoglobin Levels Pre and Post Intervention (g/dL)*

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean hemoglobin (g/dL)</th>
<th>Max hemoglobin (g/dL)</th>
<th>Min hemoglobin (g/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>5</td>
<td>10.20</td>
<td>10.70</td>
<td>9.80</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>10.00</td>
<td>11.20</td>
<td>8.40</td>
</tr>
<tr>
<td>Control</td>
<td>5</td>
<td>10.64</td>
<td>10.90</td>
<td>10.40</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>11.50</td>
<td>12.40</td>
<td>9.90</td>
</tr>
</tbody>
</table>

**Daily Milk Consumption**

Question 5 of the pre-and post-treatment survey (administered 3 months post-intervention) asked participants, “How much milk does your child drink daily? (4oz = 1 serving).” Two participants in the treatment group indicated that their child consumed less than 1 serving of milk daily pre-intervention. Three participants in the control group and three participants in the treatment group reported that their children consumed 2-3 servings of milk daily pre-intervention. Two participants in the control group and 0 in the treatment group consumed reported that their children consumed 4-5 servings of milk daily pre-intervention. Post-intervention, one participant in the treatment group reported that their child consumed less than 1 serving of milk daily. Three participants in the control group and four participants in the treatment group reported that their children consumed 2-3 servings of milk daily post-intervention. Two participants in the control
group reported that their children consumed 4-5 servings of milk daily. These results can be seen in the Figure 5.

![Figure 5. How Much Milk Does Your Child Drink Daily?](image)

**Barriers to Buying Healthy Foods**

Question 11 of the pre- and post-intervention survey (administered 3 months post-intervention) asked participants, “What is the biggest barrier to buying healthy foods?” Pre-intervention, participants’ answers were scattered across the board. Two participants in the treatment group and three participants in the control group (half of the total sample) answered, “lack of nutrition knowledge” as their biggest barrier to purchasing healthy foods. Two participants in the treatment group and one participant in the control group answered, “lack of money” as their biggest barrier to purchasing healthy foods. One participant in the control group answered “lack of time” as their biggest barrier to purchasing healthy food. One participant in the treatment group answered “other.”
Post-intervention, two participants from the control group and two from the treatment group answered, “lack of nutrition knowledge” as their biggest barrier to purchasing healthy foods. Three participants from both the control and the treatment group answered, “lack of money” as their biggest barrier to purchasing healthy foods. These results can be seen in Table 12 and Figure 6.

Table 13. *Barriers to Purchasing Healthy Foods*

<table>
<thead>
<tr>
<th></th>
<th>Lack of Knowledge</th>
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<th>Lack of Time</th>
<th>Convenience</th>
<th>Other</th>
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<tr>
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<td>0</td>
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<tr>
<td>Control Group</td>
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<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>
Individual Data

Due to the small sample size, looking at each family’s individual data gave a better insight to how the grocery store tour actually affected each family. Table 13 compares each participant’s iron knowledge scores (pre-treatment, post-treatment, and 3 month post-intervention) with their child’s hemoglobin levels pre- and post-intervention. Five of the families’ data, two families from the treatment group and three families from control group, shows that when the parent’s iron knowledge increased or stayed the same, their child’s hemoglobin increased. In three families, two from treatment group and one from control group, when the parent’s iron knowledge decreased or stayed the same, so did their child’s hemoglobin levels. Only one family’s data (from the control group), showed that when the parent’s iron knowledge decreased, their child’s hemoglobin increased. One family (in the treatment group) experienced an increase in the parent’s
iron knowledge, but the child’s hemoglobin decreased. These results can be seen in the tables below.

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<th>Subject</th>
<th>Group (T, C)</th>
<th>Iron knowledge Pre</th>
<th>Iron knowledge Post</th>
<th>Iron knowledge 3-mos.</th>
<th>Hgb (g/dL) Pre</th>
<th>Hgb (g/dL) 3-mos.</th>
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<td>11.2</td>
</tr>
<tr>
<td>2</td>
<td>T</td>
<td>2/7</td>
<td>7/7</td>
<td>6/7</td>
<td>10.4</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>T</td>
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<td>3/7</td>
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<td>9</td>
<td>C</td>
<td>3/7</td>
<td></td>
<td></td>
<td>10.9</td>
<td>12.4</td>
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<tr>
<td>10</td>
<td>C</td>
<td>3/7</td>
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<td>10.6</td>
<td>12.4</td>
</tr>
</tbody>
</table>

**Summary**

The analysis of the three assessment surveys and hemoglobin readings aided the process of determining the impact of participating in a grocery store tour on parents’ iron knowledge, their children’s consumption of iron rich foods, and hemoglobin changes. This information also provided insight to the barriers that exist which prevent parents from purchasing healthy foods in the grocery store.
CHAPTER 5

DISCUSSION

The purpose of this quasi-experimental study was to measure the effectiveness of a grocery store tour that emphasized sources of iron-rich, kid-friendly foods on the participants’ knowledge about dietary iron and iron-rich food sources. A second purpose was to determine if, three months after the grocery store tour, the serum iron levels of the children who had previously been identified by the WIC program as being low were higher as compared to the serum iron levels of the control group. This chapter will discuss the results of the study.

Subjects

The subjects for this study were ten parents of WIC children who had been identified with low iron levels (e.g., serum hemoglobin less than 11.0 mg/dL) at their 18-month certification. There were five parents in the control group (e.g., parents who chose not to participate in the grocery store tour, but consented to release their child’s hemoglobin levels and completed the iron knowledge survey) and five parents in the treatment group (e.g., parents who agreed to take part in the grocery store tour and complete the iron knowledge survey).

Discussion
The results of this study suggested that the grocery store tour intervention seemed to have little impact on the children’s hemoglobin levels. In fact, the average hemoglobin level of the treatment group decreased slightly when comparing pre- and post-intervention levels. There was also little evidence from the study that the grocery store tour intervention impacted children’s consumption of iron rich foods. However, the grocery store tour intervention seemed to have a positive impact on parents’ knowledge of iron rich foods and their ability to use unit pricing. Parents who participated in the tour scored highest on the immediate post-tour survey (p<.05). Even though the results show that the parents who participated in the grocery store tour lost a portion of the knowledge they obtained from the tour, the results also show that those parents still scored better on the final assessment survey than they did on the pre-intervention survey. Ultimately, the treatment group participants had a slight but not significant (p>.05) increase in their iron knowledge and ability to use unit pricing on a long-term basis.

As discussed earlier, large amounts of calcium in one’s diet can decrease the amount of iron absorbed from the diet. Question 5 in the pre- and post-intervention surveys asked the participants, “How much milk does your child drink?” This question was in the surveys to determine if the children who were previously identified as being anemic were consuming too much milk daily. The results suggest that neither groups of children, control nor treatment were consuming too much milk prior to or three months after the intervention. It is recommended that children consume 16oz of milk per day to obtain proper calcium levels. Results suggested that the grocery store tour did not have a significant impact on children’s consumption of milk. In fact, the results suggested that the majority of children in the treatment group were not consuming enough milk daily.
These results support the position that low levels of hemoglobin among the study children were not linked causally to large daily consumption of milk (calcium).

Question 11 of the pre- and post-intervention survey asked participants, “What is your biggest barrier to buying healthy foods?” The two most frequently mentioned barriers participants in the treatment group chose were “lack of knowledge” and “lack of money.” However, even after receiving nutrition education on iron rich foods and unit pricing via grocery store tour, three months later at the final data collection, the treatment group’s two most frequently mentioned barriers were still “lack of knowledge” and “lack of money.” In fact, the treatment and control groups did not differ in their post-intervention responses to this question. The results from this study support the statement that the implementation of a grocery store tour encouraging iron rich foods and unit pricing was not substantially effective in helping participants overcome their biggest barrier to purchasing healthy foods because of “lack of knowledge” and “lack of money.” There may be several reasons as to why the grocery store tour was ineffective in resolving those concerns. The concerns of “lack of money” and “lack of knowledge” are overriding issues, which would require far more than one grocery store tour to remedy. Also, these grocery store participants may have felt overwhelmed with all of the nutrition information available. After participating in the grocery store tour, the subjects may have realized how much more there was to learn.

WIC is special supplement nutrition program for low-income women, infants, and children. Working with the low-income population is very challenging. Families that live in poverty are in a constant state of chaos. Every aspect of their lives is a struggle: housing, communication, daycare, food security, transportation, etc. They are short on
patience, time, and money. An online survey conducted by Hart Research Associates in 2011 found that 24% of Americans (nearly one in four) worries about not having enough money to put food on the table at some point in the next year. Forty-seven percent of these worried respondents were unemployed (Tyson Foods and Food Research Action Center, 2011). Most Americans view hunger as a combination of not having enough to eat and not having the right foods to eat. Almost 75% of the US population views it especially problematic for the low-income population in America to be able to afford healthy food options (Food Research and Action Center, 2011). All of these struggles, especially food insecurity, make it difficult for parents to be able to focus on proper nutrition for their children. Making sure their child consumes adequate amounts of iron in their diet on a daily basis may not be a priority of this population. A recent report by the Food Research and Action Center found that among all households who participated in their survey during the years of 2008-2010, 8.2% of participants reported that it was “not easy to get affordable fresh fruits and vegetables.” However, those with household incomes less than $24,000 per year reported such affordability and access challenges 2.5 times more frequently (approximately 13.8 percent) than did those with incomes between $60,000 and $89,999 (5.7 percent) (Food Research and Action Center, 2011).

An evaluation of the nutritional knowledge and feeding practices at a WIC Center in Ann Arbor, Michigan, found that despite the proven benefit of the WIC program in reducing the prevalence of anemia in children of low-income families, no significant benefit from documented WIC education regarding iron was detected (Venkateswaran R, et. al, 1998). The Ann Arbor, Michigan WIC study supports the findings of this study.
All of the participants who attended the grocery store tour appeared to have a positive intervention experience. They also appeared receptive to the grocery store tour education. So, it can be suggested that the problem was not that the participants did not have a positive grocery store tour experience or that they did not learn from the tour. It may be simply be that due to their other daily struggles, adequate nutrition and their child’s iron levels is not a priority.

This conclusion is supported by the fact that the researcher had difficulty with participants making, breaking, and rescheduling appointments. It was very difficult to make contact with a family to remind them of their upcoming appointment when their phone had been disconnected. Since this population is living in a constant state of chaos, they live in the moment and deal with problems as they come. For example, an incentive for full participation in this study was receipt of a $10 gift card to Main Street Market. The immediate struggles a family is experiencing on their WIC appointment day may have influenced their decision to agree to be a participant in the research study (treatment group). A family who was having money problems on the initial data collection day of the study may have thought that 10 dollar gift card would be a lifesaver. However, if on their final data collection day this same family was doing “ok” on money, they might not make it a priority to attend the WIC appointment. Throughout the entire data collection process, getting the participants to make and commit to their appointments was a constant struggle.

Evaluating the participants’ iron knowledge and their children’s hemoglobin on an individual basis brings better insight to the data and how the grocery store tour might have affected each family. Iron knowledge scores among two treatment parents and three
control parents increased or stayed the same, while their child’s hemoglobin increased. In three families, two from treatment group and one from control group, when the parent’s iron knowledge decreased or stayed the same, so did their child’s hemoglobin levels. Only one family’s data (from the control group), showed that when the parent’s iron knowledge decreased, their child’s hemoglobin increased. One family (in the treatment group) experienced an increase in the parent’s iron knowledge, but the child’s hemoglobin decreased. According to the data, when knowledge increased or plateaued, so did one’s hemoglobin level. The majority of the parents who experienced an increase in knowledge or stayed the same, their child’s hemoglobin level also increased regardless of which group they were a participant in. This increase in knowledge from both groups raises the question, was there another form of iron education outside of the grocery store tour? Could the group’s increase in knowledge, as a whole, have come from another source? However, due to the small sample size, it is difficult to draw any hard conclusions from these data.

Ideally, the sample size for this study would be large enough to show statistical significance to better represent the target population (for example, 20 parents in the control group and 20 parents in the treatment group). However, the lack of communication and the struggle to get participants to attend their appointments are the two major reasons as to why the sample size for this research study was so small. There were a number of others who were eligible to participate in the study; however, they were unable to participate due to having missed their appointments and their being unreachable by phone. Another factor contributing to the small sample size was the researcher was not able to provide transportation to the grocery store for the tour. A number of WIC
participants rely on public transportation, so if they did not have enough money to ride the bus or if they bus stop was not within walking distance to the grocery store, then they were not able to participate in the study.
CHAPTER 6

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this quasi-experimental study was to measure the effectiveness of a grocery store tour that emphasized sources of iron-rich, kid-friendly foods on the participants’ knowledge about dietary iron and iron-rich food sources. A second purpose was to determine if, three months after the grocery store tour, the serum iron levels of the children who had previously been identified by the WIC program as being low were higher as compared to the serum iron levels of the control group. This chapter will provide conclusions, describe implications for the practice of dietetics, and provide recommendations for future research.

Conclusion

Overall, the results of this study suggested that a parent’s participation in the grocery store intervention has no significant impact on the children’s hemoglobin levels. In fact, the average hemoglobin level of the treatment group decreased slightly when comparing pre- and post-intervention levels. The results of this study also suggested that parent’s participation in the grocery store tour intervention has no significant impact on their children’s consumption of iron rich foods.
However, the grocery store tour intervention did appear to have a positive impact on parents’ knowledge of iron rich foods and their ability to use unit pricing. Parents who participated in the tour scored higher on a post tour test of iron knowledge than did control parents. Even though it appears that levels of iron knowledge among the parents who participated in the grocery store tour decreased over time, the results also show that they still scored better on the final knowledge assessment than they did on the pre-intervention survey. So, ultimately, the treatment group participants had an increase in their iron knowledge and ability to use unit pricing on a long-term basis.

When looking at the participants’ data on an individual basis, when knowledge increases or plateaus, so does one’s hemoglobin level. The majority of the parents who experienced an increase in knowledge or stayed the same had a child whose hemoglobin levels increased regardless of which group they participated in. So, the grocery store tour intervention seemed to have no effect on the child’s hemoglobin levels. However, due to the small sample size, it is difficult to draw any hard conclusions from this data.

Implications for Practice

The WIC population truly is a unique population to work with, educate, and study. The majority of people who are receiving WIC benefits nationwide live a chaotic lifestyle. This low-income population is facing the challenges of living in poverty. The results of this study support the accepted notion that adequate nutrition is not one of the top priorities of this population. Parents’ lack of specific nutrition knowledge or their gift of that knowledge may not be a strong contributing factor in whether their child gets adequate amounts of iron in their diet. The issue may be that a child’s health is less of a priority than is addressing their immediate daily nonhealth concerns. The results of this
study can help dietetic practitioners by encouraging them to seek effective education strategies for this low-income population. The key to connecting with this special population is first tackling the concerns they are identifying with before discussing nutrition and eating habits.

**Recommendations for Future Research**

Based on the results of this study, the following recommendations for future research are made:

1. Procuring a grant to help fund the ability to videotape virtual grocery tour for the participants to watch at the WIC office instead of traveling to the grocery store. This is with the hopes that lack of transportation will not have to be a deciding factor for participation in the study.

2. Gather from participants a second contact number, email address, and consent to text them. Obtaining these extra forms of communication may aid in contacting to confirm upcoming appointments, rescheduling for missed appointments, etc.

3. Increase the length of time to gather participants in order to help gather a better representative sample of the population being studied. Increasing the length of time to gather participants may also result in a larger sample size to help the results hold greater in power if the results were found to be statistically significant.

4. Create a study in which additional information can be collected from the participants such as income, ethnicity, employment status, education level, etc. This additional information may give insight as to how and why this special population makes their decisions.
5. Expanding the tour by partnering with a grocery store corporation may give the participants additional benefits of shopping at their store such as everyday discounts, nutrition education opportunities on a regular basis, and possibly markers throughout the store making it easier to make healthy food choices.

6. Assess different kinds of inventions for nutrition education to determine the most effective intervention/treatment for this low-income population.
REFERENCES


Appendix I-1 IRB Approval Letter
Institutional Review Board

DATE: November 30, 2011
TO: Stephanie Jenkins
FROM: Ball State University IRB
RE: IRB protocol # 282004-1
TITLE: EFFECTIVENESS OF A GROCERY STORE TOUR FOR PARENTS OF WIC CHILDREN WITH LOW SERUM IRON LEVELS.
SUBMISSION TYPE: New Project
ACTION: APPROVED
DECISION DATE: November 30, 2011
EXPIRATION DATE: November 29, 2012
REVIEW TYPE: Expedited Review

The Institutional Review Board has approved your New Project for the above protocol, effective November 30, 2011 through November 29, 2012. All research under this protocol must be conducted in accordance with the approved submission.

Editorial Notes:

1. You will comply with any HIPAA requirements that may be in effect or required of you.

As a reminder, it is the responsibility of the P.I. and/or faculty sponsor to inform the IRB in a timely manner:

• when the project is completed,
• if the project is to be continued beyond the approved end date,
• if the project is to be modified,
• if the project encounters problems, or
• if the project is discontinued.

Any of the above notifications should be addressed in writing and submitted electronically to the IRB (http://www.bsu.edu/irb). Please reference the IRB protocol number given above in any communication to the IRB regarding this project. Be sure to allow sufficient time for review and approval of requests for modification or continuation. If you have questions, please contact Chris Mangelli at (765) 285-5070 or cmangelli@bsu.edu.
Appendix I-2 CITI Certificate of Completion

CITI Collaborative Institutional Training Initiative
IRB Members - Basic/Refresher Curriculum Completion Report  
Printed on 2/16/2011

**Learner:** Stephanie Jenkins (username: stjenkin)  
**Institution:** Ball State University  
**Contact Info:** Department: Family and Consumer Sciences  
Email: sljenkins@bsu.edu  

**IRB Members - Basic/Refresher:** This Basic Course is appropriate for IRB or Ethics Committee  

Stage 1. Basic Course Passed on 02/16/11 (Ref # 5642008)

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For this Completion Report to be valid, the learner listed above must be affiliated with a CITI participating institution. Falsified information and unauthorized use of the CITI course site is unethical, and may be considered scientific misconduct by your institution.

Paul Braunschweiger Ph.D.
Professor, University of Miami
Director Office of Research Education
CITI Course Coordinator

Appendix II-1 Control group’s consent form
Appendix II-1

Consent Form: Control Group

Study Title  Effectiveness of a grocery store tour for parents of WIC children with low serum iron levels.

Study Purpose and Rationale

- Iron deficiency anemia is a serious health condition that can come from poor eating habits. To reduce a child’s risk for iron-deficiency anemia, it is essential that a family’s primary grocery shopper be knowledgeable about what foods are good sources of iron.
- The focus of this study is to see if a grocery store tour for parents of WIC (women, infants, and children) children with low iron levels can have a significant impact on their knowledge of iron-rich foods and, ultimately, on their child’s serum iron levels.
- The purpose of this quantitative research study is to measure the effectiveness of a grocery store tour that emphasizes iron-rich, kid-friendly foods on parents’ knowledge of iron-rich foods and, three months after the tour, on the serum iron levels of WIC children previously identified as having low iron levels.

Inclusion/Exclusion Criteria

- Individuals who are eligible to participate in this study are parents/legal guardians of WIC children, in Delaware County, who are approximately 18 months old who had a low iron reading at their 18-month certification appointment. Participants must be at least 18 years of age.

Disclosure of Alternative Procedures

- If a child’s hemoglobin level is low at their 18-month certification, this child’s parents are eligible to participate in this study.
- The participants will not participate in the grocery store tour.
- At each child’s 24-month WIC appointment his/her iron will be rechecked. Also every participant, the same parent who completed the first assessment, will complete the post-grocery store tour assessment.
- This research study will take three months to complete.

Data Confidentiality

- Data are confidential when the identities of the respondents are or cannot be known by someone but the research team protects participants’ identities from being associated with the data.
- All information obtained by WIC employees will be kept confidential. Every employee of WIC at the start of employment signs a confidentiality form protecting clients.

Storage of Data
• All information and data collected will be stored in a securely locked file cabinet in the office of Dr Alice Spangler at Ball State University. The data will be available to Dr. Spangler, my thesis committee, my statistician, and myself.
• After the study is complete, participants’ surveys and documentation showing participation in this study will be shredded.
• WIC will keep a record of each child’s iron levels on file to show proof of eligibility for WIC.

**Risks or Discomforts**
• There are no anticipated risks for participating in this study.

**Potential Benefits**
• Increase nutrition knowledge
• Gain knowledge of iron’s role in the body and what foods are good sources of iron
• Hopefully an improvement in your child’s iron status
• Grocery store tour counts as one nutrition education contact that is required to continue eligibility with WIC

**Voluntary Participation**
• Your participation in this study is completely voluntary and you are free to withdraw your permission at anytime for any reason without penalty or prejudice from the investigator and the WIC employees. Please feel free to ask any questions of the investigator before signing this form and at any time during the study.

**IRB Contact Information**
• For questions about your rights as a research subject, please contact Director, Office of Research Integrity, Ball State University, Muncie, IN 47306, (765) 285-5070, irb@bsu.edu.
**Study Title**  Effectiveness of a grocery store tour for parents of WIC children with low serum iron levels. The primary investigator is Stephanie Jenkins.

**Consent**

I, ___________________, agree to release my child ____________________’s iron levels in this research project entitled, “Effectiveness of a grocery store tour for parents of WIC children with low serum iron levels.” I also agreed to complete the pre and post survey. I have had the study explained to me and my questions have been answered to my satisfaction. I give my consent to participate. I understand that I will receive a copy of this informed consent form to keep for future reference.

________________________________________  ______________

Participant’s Signature  Date

**Researcher Contact Information**

**Principal Investigator:**  
Stephanie Jenkins, Graduate Student  
Department of Family and Consumer Sciences  
Ball State University  
Muncie, IN  47306  
Telephone: (502) 939-0495  
Email: sljenkins@bsu.edu

**Faculty Advisor:**  
Dr. Alice Spangler  
765-285-1470  
aspangle@bsu.edu
Appendix II-2 Treatment group’s consent form
Appendix II-2

Consent Form: Treatment Group

**Study Title**  Effectiveness of a grocery store tour for parents of WIC children with low serum iron levels.

**Study Purpose and Rationale**
- Iron deficiency anemia is a serious health condition that can come from poor eating habits. To reduce a child’s risk for iron-deficiency anemia, it is essential that a family’s primary grocery shopper be knowledgeable about what foods are good sources of iron.
- The focus of this study is to see if a grocery store tour for parents of WIC (women, infants, and children) children with low iron levels can have a significant impact on their knowledge of iron-rich foods and, ultimately, on their child’s serum iron levels.
- The purpose of this quantitative research study is to measure the effectiveness of a grocery store tour that emphasizes iron-rich, kid-friendly foods on parents’ knowledge of iron-rich foods and, three months after the tour, on the serum iron levels of WIC children previously identified as having low iron levels.

**Inclusion/Exclusion Criteria**
- Individuals who are eligible to participate in this study are parents/legal guardians of WIC children, in Delaware County, who are approximately 18-months old, who had a low iron reading at their 18-month certification appointment. Participants must be at least 18 years of age.

**Participation Procedures and Duration**
- If a child’s hemoglobin level is low at their 18-month certification, this child’s parents are eligible to participate in this study. The treatment group will sign the consent form, and take the pre and post assessment at the grocery store.
- Half of the participants will participate in a grocery store tour emphasizing iron-rich, kid-friendly foods. This grocery store tour will take place at the Hoyt Street Marsh grocery store. This tour will take approximately 30 minutes in length. The other half of the participants will not participate in the grocery store tour.
- At each child’s 24-month WIC appointment his/her iron will be checked. Also every participant, the same parent who completed the first survey, will complete the post-grocery store tour assessment.
- This research study will take three months to complete.

**Disclosure of Alternative Procedures**
• If this child has a low iron reading at their 18-month certification, this child’s parents are eligible to participate in this study. These participants will complete the pre assessment at their nutrition education contact appointment.
• The participants will not participate in the grocery store tour.
• At each child’s 24-month WIC appointment his/her iron will be rechecked. Also every participant, same parent who completed first assessment will complete the post-grocery store tour assessment.
• This research study will take three months in length.

Data Confidentiality
• Data are confidential when the identities of the respondents are or can not be known by someone but the research team protects participants’ identities from being associated with the data.
• All information obtained by WIC employees will be kept confidential. Every employee of WIC at the start of employment signs a confidentiality form protecting clients.

Storage of Data
• All information and data collected will be stored in a securely locked file cabinet in the office of Dr Alice Spangler at Ball State University. The data will be available to Dr. Spangler, my thesis committee, my statistician, and myself.
• After the study is complete, participants’ surveys and documentation showing participation in this study will be shredded.
• WIC will keep a record of each child’s iron levels on file to show proof of eligibility for WIC.

Risks or Discomforts
• There are no anticipated risks for participating in this study.

Potential Benefits
• Increase nutrition knowledge
• Gain knowledge of iron’s role in the body and what foods are good sources of iron
• Increase ability to use unit pricing to select inexpensive iron-rich food sources
• Hopefully an improvement in your child’s iron level/status
• Grocery store tour counts as one nutrition education contact that is required to continue eligibility with WIC.

Compensation
• Every participant who completes this study in its entirety will receive a ten-dollar Marsh gift card.

Voluntary Participation
Your participation in this study is completely voluntary and you are free to withdraw your permission at anytime for any reason without penalty or prejudice from the investigator and the WIC employees. Please feel free to ask any questions of the investigator before signing this form and at any time during the study.

**IRB Contact Information**

For questions about your rights as a research subject, please contact Director, Office of Research Integrity, Ball State University, Muncie, IN 47306, (765) 285-5070, irb@bsu.edu.
Study Title  Effectiveness of a grocery store tour for parents of WIC children with low serum iron levels. The primary investigator is Stephanie Jenkins.

**********

Consent

I, ____________________, agreed to participate in this research project entitled, “Effectiveness of a grocery store tour for parents of WIC children with low serum iron levels.” I agreed to release my child ____________________’s iron levels in this research project. I have had the study explained to me and my questions have been answered to my satisfaction. I have read the description of this project and give my consent to participate. I understand that I will receive a copy of this informed consent form to keep for future reference.

To the best of my knowledge, I meet the inclusion/exclusion criteria for participation (described on the previous page) in this study.

______________________________  ________________
Participant’s Signature           Date

Researcher Contact Information

Principal Investigator:  Faculty Advisor:

Stephanie Jenkins, Graduate Student  Dr. Alice Spangler
Department of Family and Consumer Sciences
Ball State University
Muncie, IN  47306
Telephone: (502)939-0495  765-285-1470
Email:  sljenkins@bsu.edu  aspangle@bsu.edu
Appendix III-1 Pre and Post grocery store tour assessment
Appendix III-1

Iron Knowledge Survey

Name__________________________ Child’s Name______________________________

WIC Household ID_____________________

Please mark the answer you think is correct like this ☑.

1) What does iron do for our body?
   ☑ It helps grow and repair the tissues in your body
   ☑ It helps protect your cells from damage
   ☑ It helps build red blood cells and carries oxygen to your body cells
   ☑ It helps improve your vision

2) All of these are signs that your child may have low-iron levels except:
   ☑ feels tired and weak
   ☑ increased appetite
   ☑ has trouble learning
   ☑ gets sick easily

3) Which group of foods are the highest source of iron?
   ☑ carrots, turkey, and orange juice
   ☑ green leafy vegetables, beans, and red meat
   ☑ cow’s milk, peanuts, and chicken
   ☑ potatoes, goldfish crackers, and yogurt

4) Which vitamin helps iron to be absorbed in our body?
   ☑ Vitamin D
   ☑ Vitamin B12
   ☑ Vitamin A
   ☑ Vitamin C

5) How much milk does your child drink daily? (1 serving = 4oz)
   ☑ Less than 1 serving
   ☑ 2-3 servings
   ☑ 4-5 servings
   ☑ More than 6 servings

6) Which of these cereals do you think has the most iron?
   ☑ Multi-Grain Cheerios
   ☑ Rice Krispies
   ☑ Honey Bunches of Oats
   ☑ Life Cereal
7) Which of these high iron foods do you think would be the least expensive per serving?

☐ fresh spinach
☐ beans (black, kidney, navy, etc)
☐ hamburger meat
☐ pork chops

8) Circle how often your child eats these foods:

<table>
<thead>
<tr>
<th>Food</th>
<th>Frequency</th>
<th>Daily</th>
<th>3-4 times/week</th>
<th>1-2 times/week</th>
<th>less than once a week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>Daily</td>
<td></td>
<td>3-4 times/week</td>
<td>1-2 times/week</td>
<td>less than once a week</td>
</tr>
<tr>
<td>Pork</td>
<td>Daily</td>
<td></td>
<td>3-4 times/week</td>
<td>1-2 times/week</td>
<td>less than once a week</td>
</tr>
<tr>
<td>Eggs</td>
<td>Daily</td>
<td></td>
<td>3-4 times/week</td>
<td>1-2 times/week</td>
<td>less than once a week</td>
</tr>
<tr>
<td>Chicken</td>
<td>Daily</td>
<td></td>
<td>3-4 times/week</td>
<td>1-2 times/week</td>
<td>less than once a week</td>
</tr>
<tr>
<td>Beans</td>
<td>Daily</td>
<td></td>
<td>3-4 times/week</td>
<td>1-2 times/week</td>
<td>less than once a week</td>
</tr>
</tbody>
</table>

9) Circle how often your child eats these cereals:

<table>
<thead>
<tr>
<th>Cereal</th>
<th>Frequency</th>
<th>Daily</th>
<th>3-4 times/week</th>
<th>1-2 times/week</th>
<th>less than once a week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frosted Mini-Wheats</td>
<td>Daily</td>
<td></td>
<td>3-4 times/week</td>
<td>1-2 times/week</td>
<td>less than once a week</td>
</tr>
<tr>
<td>Multi-Grain Cheerios</td>
<td>Daily</td>
<td></td>
<td>3-4 times/week</td>
<td>1-2 times/week</td>
<td>less than once a week</td>
</tr>
<tr>
<td>Kix</td>
<td>Daily</td>
<td></td>
<td>3-4 times/week</td>
<td>1-2 times/week</td>
<td>less than once a week</td>
</tr>
<tr>
<td>Quaker Oatmeal</td>
<td>Daily</td>
<td></td>
<td>3-4 times/week</td>
<td>1-2 times/week</td>
<td>less than once a week</td>
</tr>
</tbody>
</table>

10) Why is it important to limit the amount of milk your child drinks?

☐ It contains too much iron
☐ It contains too much protein
☐ It contains no iron and may prevent your child from eating other foods
☐ Never limit the amount of milk a child drinks

11) What is your biggest problem when trying to make healthy foods choices at the grocery store?

☐ Lack of nutrition knowledge
☐ Lack of money
☐ Lack of time to grocery shop
☐ Easier to eat out or buying pre-packaged foods
☐ Other __________________
Appendix IV Nutrition Education Iron Handout
Low-iron can make your child:
• Look pale  • Feel tired and weak  • Eat poorly  • Get sick more easily  • Have trouble learning

If you are pregnant, and have low iron, your baby could be born too soon or too small.

The best way to improve low-iron blood is to eat foods high in iron!
• Infants younger than 1 year should drink only breast milk or infant formula supplemented with iron.
• It is important for breastfed infants to receive iron-fortified solid foods starting at about 6 months of age
• Iron-fortified products such as all WIC Cereals can be a great way for kids to get more iron.

<table>
<thead>
<tr>
<th>Foods high in Iron with serving size</th>
<th>1 - 2 yrs</th>
<th>2 - 3 yrs</th>
<th>4 - 5 yrs</th>
<th>Adult Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIC Cereals</td>
<td>2-4 T</td>
<td>4-6 T</td>
<td>½ - 1 c</td>
<td>1 c</td>
</tr>
<tr>
<td>Meats</td>
<td>1-2 T</td>
<td>2-3 T</td>
<td>4-5 T</td>
<td>1-3 oz</td>
</tr>
<tr>
<td>Dried Beans/Peas</td>
<td>1-2 T</td>
<td>2-4 T</td>
<td>½ c</td>
<td>½ c</td>
</tr>
<tr>
<td>Fish</td>
<td>1-2 T</td>
<td>2-3 T</td>
<td>4-5 T</td>
<td>1-3 oz</td>
</tr>
<tr>
<td>Baked Beans</td>
<td>1-2 T</td>
<td>2-4 T</td>
<td>½ c</td>
<td>½ c</td>
</tr>
<tr>
<td>Sunflower Seeds (Choking Hazard)</td>
<td>0.5 T</td>
<td>1 T</td>
<td>1 T</td>
<td>2 T</td>
</tr>
<tr>
<td>Eggs</td>
<td>½ T</td>
<td>½ - 1 T</td>
<td>1 T</td>
<td>1 T</td>
</tr>
<tr>
<td>Whole Grain Breads</td>
<td>½ slice</td>
<td>½ - 1 slice</td>
<td>½ - 1 slice</td>
<td>1 slice</td>
</tr>
<tr>
<td>Raisins (Choking Hazard)</td>
<td>0 T</td>
<td>½ C</td>
<td>½ C</td>
<td>½ C</td>
</tr>
<tr>
<td>Dried Fruits (Choking Hazard)</td>
<td>0 T</td>
<td>4 pieces</td>
<td>8 pieces</td>
<td>10 pieces</td>
</tr>
<tr>
<td>Dark, Leafy, Green Vegetables</td>
<td>1-2 T</td>
<td>3-4 T</td>
<td>4 T</td>
<td>1 c</td>
</tr>
<tr>
<td>Peanut Butter (Choking Hazard)</td>
<td>0 T</td>
<td>1-2 T</td>
<td>2 T</td>
<td>2 T</td>
</tr>
</tbody>
</table>

* Foods highest in iron are at the top of the chart

Foods with Vitamin C like fruits and juices work with Iron to build strong blood.
Try these Vitamin C + Iron food combinations:
• WIC Cereal and WIC Juice
• Crackers and WIC Peanut Butter served with fruit

Try this delicious Iron-rich recipe and serve with WIC fruit juice!

**WIC Cereal Mix:**

**Ingredients**
- ½ cup butter or margarine
- 1 tsp seasoned salt
- ¾ tsp Worcestershire sauce
- 2 ½ cups Corn Chex or Cheerios
- 2 ½ cup Wheat Chex
- 1 cup peanuts or mixed nuts
- 1 cup pretzels
- 1 cup raisins

**Directions**
1. Melt margarine in roasting pan.
2. Stir in seasoned salt and Worcestershire sauce.
3. Add cereal, nuts, raisins, and pretzels.
4. Bake 1 hour in 250° oven while stirring and turning occasionally

*Warning: Children younger than 3 should not be given peanuts, nuts, pretzels, or raisins due to choking hazards.

Indiana WIC Program • This institution is an equal opportunity provider
Appendix V Outline of grocery store tour
Appendix V

Grocery Store Tour Outline- Marsh Grocery Store

1) Discuss iron’s role in our bodies
   a) basic functions and importance of nutrient
   b) common reason why iron deficiency occurs-diet low in iron
   c) signs and symptoms of iron deficiency

2) Discuss what foods are good sources of iron with goal of hitting all food groups
   a) Provide several kid-friendly
   b) Discuss possible various cooking options (grilled, baked, etc.)

3) Discuss what foods, nutrients, and beverages inhibit iron absorption

4) Walk throughout the various departments and aisles pointing out and talking about
    what foods are high in iron
   a) Provide basic reasoning to food
   b) Emphasizing foods that WIC provides
   c) Be sure to encourage iron-fortified cereals (emphasis the highest 2-3 cereals)
   d) Discuss simple ideas of how to incorporate this food into daily menu or recipe

5) Discuss cost effective ways to buy kid-friendly, iron rich foods on a budget
   a) Work on unit pricing
   b) Explain what foods are the highest in iron but are the least expensive, getting the
      most bang for your buck

6) Conclude with any questions
Appendix VI-1 Letter of permission to Delaware County WIC coordinator
September 18th, 2011

Dear Leanna Cole,
Delaware County WIC Coordinator
Open Door Health Services
P.O. Box 1676
Muncie, IN 47308

I am writing you to ask permission to conduct a research study measuring the effectiveness of a grocery store tour that emphasizes iron-rich, kid-friendly foods on parents’ knowledge of iron-rich foods. A second purpose is to determine if there is any relationship between attendance at the grocery store tour and the serum iron levels of WIC (Supplemental Women, Infants, and Children) children previously identified as having low iron levels three to six months after the tour. This study will involve parents’ of children who are participants of the Delaware county WIC program with low iron levels. I, Stephanie Jenkins, will be conducting the research and analyzing the data.

If you have any questions or concerns please contact me at (502) 939-0495 or sljenkins@bsu.edu.

Sincerely,

Stephanie Jenkins
Appendix VI-II Letter of permission from Delaware County’s WIC Coordinator
November 1, 2011

To Whom It May Concern:

It is my pleasure to write a letter of support for the study: The effectiveness of a grocery store tour for parents of WIC children with low serum iron level.

WIC helps to reduce levels of anemia. The findings of the study will assist WIC with improving nutrition education strategies.

Sincerely,

Leanna K. Cole, M.A. R.D. C.D.
WIC Coordinator
Open Door Health Services
3715 S. Madison Street
Muncie, IN 47302
p: (765) 381-0450
f: (765) 213-2769
lkcole@opendoorhs.org
Appendix VII-1 Series of Appointments for WIC Children
Appendix VII

*Length of time between appointments is 3 months

<table>
<thead>
<tr>
<th>Appointment 1</th>
<th>Appointment 2</th>
<th>Appointment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Certification</strong></td>
<td><strong>Nutrition Education</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Income History</strong></td>
<td><strong>Nutrition Education</strong> - discuss nutrition risk factors from last visit</td>
<td><strong>Income History</strong></td>
</tr>
<tr>
<td><strong>Demographics:</strong> proof of residence, photo ID, contact info, &amp; caretakers?</td>
<td><strong>Issue Checks:</strong> client sign for 3 months of checks</td>
<td><strong>Demographics:</strong> proof of residence, photo ID, contact info, &amp; caretakers?</td>
</tr>
<tr>
<td><strong>Health Information:</strong> medical conditions, household smoking, daily TV usage, currently breastfeeding?</td>
<td><strong>Schedule Next Appointment:</strong> appointment is set close to the date checks end</td>
<td><strong>Health Information:</strong> medical conditions, household smoking, daily TV usage, currently breastfeeding</td>
</tr>
<tr>
<td><strong>Weight/Height, &amp; Blood:</strong> ?</td>
<td></td>
<td><strong>Weight/Height, &amp; Blood:</strong> ?</td>
</tr>
<tr>
<td><strong>Immunizations:</strong> show proof</td>
<td></td>
<td><strong>Immunizations:</strong> show proof</td>
</tr>
<tr>
<td><strong>Vena:</strong> questions related to child’s nutrition status</td>
<td></td>
<td><strong>Vena:</strong> questions related to child’s nutrition status</td>
</tr>
<tr>
<td><strong>Risk Factors:</strong> nutrition related</td>
<td></td>
<td><strong>Risk Factors:</strong> nutrition related</td>
</tr>
<tr>
<td><strong>Referrals:</strong> offer</td>
<td></td>
<td><strong>Referrals:</strong> offer</td>
</tr>
<tr>
<td><strong>Nutrition Education</strong></td>
<td></td>
<td><strong>Nutrition Education</strong></td>
</tr>
<tr>
<td><strong>Food Prescription:</strong> add client’s food package into computer system</td>
<td></td>
<td><strong>Food Prescription:</strong> add client’s food package into computer system</td>
</tr>
<tr>
<td><strong>SOAP Note:</strong> details of appointment (subjective, objective, assessment, plan)</td>
<td></td>
<td><strong>SOAP Note:</strong> details of appointment (subjective, objective, assessment, plan)</td>
</tr>
<tr>
<td><strong>Issue Checks:</strong> clients sign for 3 months of checks</td>
<td></td>
<td><strong>Issue Checks:</strong> clients sign for 3 months of checks</td>
</tr>
</tbody>
</table>