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Preventing Childhood Obesity in School-Aged Children: Relationships between Reading Nutrition Labels and Healthy Dietary Behaviors

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PREVENTING CHILDHOOD OBESITY IN SCHOOL-AGED CHILDREN: RELATIONSHIPS BETWEEN READING NUTRITION LABELS AND HEALTHY DIETARY BEHAVIORS

by

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ABSTRACT

Childhood obesity is a prevalent problem in the United States. Obesity increases the risk for many diseases. Obese children are likely to become obese adults with additional co-morbidities. Studies have reported mixed findings regarding associations between reading nutrition labels and improved dietary behaviors/healthy weight status. The purpose of this study is to determine whether the frequency of children reading nutrition labels is related to frequency of performing 12 dietary behaviors. De-identified baseline data from a previous quasi-experimental pilot study were analyzed. Data were collected from 4^{th} and 5^{th} graders (n = 42) at an after-school program. An adapted paper survey was administered to the children to measure the number of days (0 – 7) they read nutrition labels and performed 12 dietary behaviors over the preceding week. Due to non-normal distribution of data, non-parametric Spearman rho correlations were conducted to determine relationships between frequency of reading nutrition labels and dietary behaviors. Positive correlations were found between frequency of reading nutrition labels and eating fruit for breakfast; eating vegetables at lunch/dinner; eating whole grain/multigrain bread ($p < .05$); eating fruit for a snack; eating vegetables for a snack ($p < .01$). Frequency of reading nutrition labels was inversely related to drinking soda/sugar-sweetened beverages ($p < .05$). Significant relationships were found between frequency of reading nutrition labels and several dietary behaviors associated with childhood obesity prevention. Findings are promising and support the need for further intervention research to determine potential direct influences of children reading nutrition labels on dietary behaviors.

DEDICATION

For my family and my friends, especially my parents,
for filling my life with beautiful memories
and inspiring me to do my best every day.

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INTRODUCTION

In the United States, one in six children suffer from obesity (Centers for Disease Control and Prevention [CDC], 2015a). School-aged children, 9 to 11 years old, are at an impressionable stage in their lives as they begin to gain some independence and responsibilities. Therefore, this is an important time for them to establish healthy lifestyle behaviors. If children are taught and encouraged to make healthy decisions early on, it is more likely that they will continue to make healthy decisions as they age (McGill, 2016). This includes making well-informed decisions about their food and beverage intake to achieve or maintain a healthy weight.

BACKGROUND

Prevalence of Childhood Obesity in the United States

Childhood obesity (CO) is a prevalent and dangerous problem among children today (Kelsey, Zaepfel, Bjornstad, & Nadeau, 2014). The prevalence of obesity in children and adolescents in 2011-2014 was 17%, and the prevalence of extreme obesity was 5.8% (Ogden et al., 2016). Obese children are more likely to develop serious health problems that may have been prevented compared to non-obese children, including early-onset type 2 diabetes, orthopedic problems, psychiatric illnesses, cardiovascular disease, polycystic ovarian syndrome, non-alcoholic fatty liver disease, certain cancers, and obstructive sleep apnea (Kelsey et al., 2014). Consequently, obese children are being treated for and learning how to live with disorders that used to be found only in the adult population. Obese children are also more likely to grow into obese adults compared to non-obese children, which will result in obese adults with chronic health problems and a higher risk of early morbidity (Kelsey et al., 2014). In 2015, over half of the states in the United States reported at least 10% of their high schoolers were obese (CDC, 2015b). If young children are not encouraged to develop healthy dietary behaviors early in their lives, they will be at higher risk for developing health problems that continue into their adolescent and adult years.

Children from a low socioeconomic background are at increased risk for becoming overweight or obese (Kallem et al., 2013; Wong, Chou, & Ahmed, 2014). Many “cheap” food and beverage options are not healthy choices, but because they are inexpensive it is common for families of a low socioeconomic status to purchase them (Wong et al., 2014).

A child's race and/or ethnicity is an indicator for obesity risk factors as well, and should be taken into consideration (Ogden et al., 2016). School-aged children who are African-American or Hispanic have a higher chance of being overweight compared to Caucasian or Asian school-aged children (Ogden et al., 2016; Wong et al., 2014). African-American children have been found to eat more overall calories, eat more meats, and have fruit juice account for half of their total fruit intake, while Hispanic children have been found to eat more fruits, less grains, and less meats (Salvo, Frediani, Ziegler, & Cole, 2012). Both African-American and Hispanic children have been found to drink large amounts of sugary drinks and eat large portion sizes (Salvo et al., 2012).

Dietary Behaviors Associated with Childhood Obesity

Unhealthy dietary behaviors and poor dietary influences contribute to a child's risk for becoming overweight or obese (Quick et al., 2017; Zarychta, Mullan, & Luszczynska, 2016). Eating less than the recommended amounts of fruits, vegetables, and whole grains can lead to an increased risk of developing chronic diseases and disorders (Sharma et al., 2016). Many children in the United States do not meet their recommended daily amounts of healthy foods such as whole grains, vegetables, and fruits, yet they do eat junk foods and sugary beverages (Anderson, Ramsden, & Kaye, 2016). However, even children who do eat the before mentioned healthy foods eat unhealthy foods and beverages as well (Anderson et al., 2016), which may negatively impact the benefits gained from eating the healthier options. It is recommended that less than 10% of caloric consumption per day should come from added sugars (U.S. Department of Health and Human Services [HHS] and the United States Department of Agriculture [USDA], 2015a),

but eating and drinking large amounts of junk foods and sugary beverages can cause the percentage of added sugars in a diet to go above 10% of total calories very rapidly.

Research has found the practice of skipping breakfast to be associated with various adverse effects (Coppinger, Jeanes, Hardwick, & Reeves, 2012; Rosato et al., 2016), and children who eat breakfast can have a greater daily intake of vitamins, calcium, dietary fiber, and a healthier weight status compared to children who skip breakfast (Affenito et al., 2013; Koo Hui, Abdul Jalil, & Talib, 2015). Children who are African-American or Hispanic are less likely to eat breakfast at home, as well as more likely to benefit from school breakfast programs compared to Caucasian children (Dykstra et al., 2016). Children who eat breakfast regularly are less likely to become overweight or obese compared to children who skip breakfast (Antonogeorgos et al., 2012; Olson, Aldrich, Callahan, Matthews, & Gance-Cleveland, 2016). Some common sources of added sugar in breakfast foods that children might not be aware of include fruit smoothies, flavored yogurts, and granola bars, all of which are popular food choices for breakfast (Minooka, 2017). Sugary breakfast cereals can also contribute a large amount of sugar to children's diets (Environmental Working Group, 2014). While breakfast should not be skipped, the meal should consist of healthy and nutritionally rich foods to be beneficial.

While some popular brands of breakfast cereal contain large amounts of added sugar, eating non-sugary cereals for breakfast can be a healthy and beneficial choice (Affenito et al., 2013; Koo Hui et al., 2015). Children who eat whole-grain cereal for breakfast are more likely to have increased levels of vitamin A, vitamin C, iron, folate, dietary fiber, calcium, and whole grains and decreased levels of cholesterol in their diets compared to children who eat non-cereal foods for breakfast (Affenito et al., 2013; Koo Hui et al., 2015).

Children commonly eat fruit as a snack and/or as a component of lunch or breakfast, and typically eat vegetables with dinner (Moore, Hamner, Kim, & Dalenius, 2016). The USDA recommends that physically active school-aged children eat 1 to 2 cups of fruit daily (not including fruit juice), and 1.5 to 2.5 cups of vegetables daily as part of a healthy diet (USDA, 2017a; USDA, 2017b). Overweight and obese children have been found to eat less fruits and vegetables daily than children of a healthy weight (Miller, Moore, & Kral, 2011). One study found that eating fruits and vegetables on a regular basis may not only reduce the risk of weight gain, but also reduce the risk of developing hypertension and cancer (Boeing et al., 2012). In fact, simply including apples or apple-products in a child's diet may potentially reduce his or her risk for obesity (O'Neil, Nicklas, & Fulgoni III, 2015).

It is recommended that children between 7 and 18 years old should limit their fruit juice intake to 8 ounces, or 1 cup, per day (Korioth, 2017). Some studies found no statistically significant associations between drinking 100% fruit juice and an increase in body mass index (BMI) percentiles in children 7 to 18 years old, but did find links to drinking 100% fruit juice and obesity among children younger than 6 years old (Auerbach et al., 2017). One study found that school-aged children drank more 100% fruit juice than in their younger years, and African-American and Hispanic children drank more than Caucasian children (Beck, Patel, & Madsen, 2013). In addition, children of financially disadvantaged families are more likely to have two or more servings of 100% fruit juice daily (Beck et al., 2013; C.S. Mott Children's Hospital, 2012).

Children commonly are introduced to milk and other dairy-based beverages as toddlers by drinking plain, unflavored milk more often than most other beverages (Grimes, Szymlek-Gay, & Nicklas, 2017). One study found that when children 2 to 19 years old drank milk frequently,

they drank considerably more whole, 2%, and/or flavored milk than skim or low-fat (Rehm, Drewnowski, & Monsivais, 2015). It is more likely for children to not drink any milk at all than to drink skim or low-fat milk (Rehm et al., 2015), but drinking milk products in general has proven to be more beneficial than not. Another study found that adolescents who drank two or more servings of milk daily were less likely to be obese compared to adolescents who did not (Abreu et al., 2014). Low-fat milk products may be more beneficial than other milk products though, considering that when a group of young, obese boys replaced their usual breakfast beverages with specifically low-fat milk they consumed fewer calories throughout the day and experienced improved satiety (Mehrabani et al., 2016).

According to the USDA, individuals in the United States (U.S.) commonly eat products that contain grain, but do not consume enough whole grains (USDA, 2016). To maintain a healthy diet, it is recommended that at least half of the grains a person eats daily should be whole grains rather than refined (USDA, 2016). Children 9 to 18 years old should eat between 5 and 8 ounces of grains daily, with at least 3 to 4 of those ounces consisting of whole grains (USDA, 2016). Children who ate whole grains were found to have lower BMI percentiles and a reduced risk for obesity compared to children who did not (Choumenkovitch et al., 2013).

Children begin drinking water soon after they are born. The most common beverages consumed by infants are formula, breast milk, water, and 100% fruit juice, with water intake increasing with age (Grimes et al., 2017). Plain, unflavored water has been found to be one of the most popular beverages among toddlers, but it is more common for sugar-sweetened beverages (SSBs) to be included in children's diets as they grow older (Grimes et al., 2017). Choosing to drink water more than SSBs can have a positive effect on food intake, because children who

drink water are more likely to include fruit, vegetables, and milk in their diet, while children who drink soda are more likely to include candy, chips, and cookies (López-Barrón, Jiménez-Cruz, & Bacardí-Gascón, 2015). While mixed results have been found regarding whether drinking water results in weight loss and/or reduced obesity risk, associations have been found between frequently drinking water and reduced BMI percentiles (Muckelbauer et al., 2014).

While some studies have not conclusively made a connection between 100% juice intake and obesity (Auerbach et al., 2017), there is evidence in the literature supporting the association between increased soda intake and obesity (Tucker, Tucker, Bailey, & LeCheminant, 2015). However, there are additional beverages other than sodas that pose potential health problems for children due to their high added sugar content. These are categorized as sugar-sweetened beverages (SSBs) and include sweetened teas, energy drinks, sports drinks, flavored juice drinks, and electrolyte replacement drinks (Letourneau, 2016). A healthy eating pattern includes limiting added sugars in the diet (Office of Disease Prevention and Health Promotion [ODPHP], 2015), and some of the biggest sources of added sugar are sodas and sugared beverages (HHS and USDA, 2015b). Since consumption of SSBs in children 9 to 11 years old is associated with high BMI percentiles, large waist circumferences, and low HDL cholesterol levels (Kosova, Auinger, & Bremer, 2013), excess intake of SSBs should be discouraged in school-aged children to prevent obesity and other health disparities.

Reading Nutrition Labels and Healthy Dietary Behaviors

People often consider the price, familiarity, and enjoyment of foods and beverages more often than they take the nutritional value into account (Hunsberger, McGinnis, Smith, Beamer, &

O'Malley, 2015; Pettigrew & Pescud, 2013). To teach and promote healthy dietary choices to families and children, the US Food and Drug Administration (FDA) implemented an educational youth outreach campaign program in 2007. It is currently known as "Read the Label," an educational initiative targeting children 9 to 13 years old that involves reading nutrition labels (FDA, 2017). The program's goal is to equip youth with the necessary tools to promote health and achieve or maintain a healthy weight.

Relatively few studies have been conducted to determine associations between reading nutrition labels on foods/beverages and dietary behaviors linked to childhood obesity, and they have reported mixed results. When a group of individuals ranging from 9 to 18 years old in England were asked if they read food labels at fast food restaurants, over half of them said that the labels did not alter their food choices (Wethington, Maynard, & Blanck, 2013). When children did take the time to read food labels, more girls reported reading them than boys (Wethington et al., 2013). Additionally, obese children were found to read the labels more often than non-obese children (Wethington et al., 2013). The reasons for these results are unclear, but the authors suggested that perhaps these obese adolescents were trying to be more aware of the caloric content of foods and beverages (Wethington et al., 2013). Many children who participated in studies that involved nutrition labels did not change their way of eating based on the labels alone, but did respond positively to the combination of nutrition labels and interactive health intervention that taught them about the importance of eating foods (Williams et al., 2016; Larsen et al., 2017).

The purpose of this study is to determine the relationships between the frequency of

reading nutrition labels and the frequency of specific dietary behaviors in primarily socioeconomically disadvantaged African-American school-aged children.

METHODS

This study analyzed de-identified baseline data that was collected for a quasi-experimental pilot study, using a longitudinal descriptive design. Approval to conduct this study was obtained from the Institutional Review Board at the University of Central Florida.

The pre-existing de-identified data from the original study were collected from children at two different Boys and Girls Club of Central Florida (BGCCF) locations. The participants in the original study were 4th and 5th graders enrolled in one of the previously mentioned BGCCF locations. Boys and girls were both included in the study.

Procedures

Information about participating in the original study was presented by the primary investigator to children at both BGCCF locations. Children were provided with parental consent forms that needed to be signed by their parent (or legal guardian) for them to participate. Both parental consent and child verbal assent were obtained from and required of each participant. To collect the baseline data for the original intervention study, all participants completed a self-administered paper survey during their afterschool program. After the baseline data were collected, each participant was given a small toy (< $5.00 value) as an incentive gift. Throughout the course of this current study, no incentives or compensation were needed because only pre-existing de-identified data were used. The baseline data collected from the original study were de-identified before being analyzed for this current study, which involves analyzing the relationships between children reading food labels and performing specific dietary behaviors.

The inclusion criteria were as follows: participant must be in 4th or 5th grade and enrolled in the BGCCF afterschool program at either of the two locations used. The exclusion criteria for this study were as follows: participant is unable to speak or read English fluently.

Instrument

The 49-item paper survey used to collect the original baseline data was adapted from the Youth Behavior Risk Survey and the CATCH Kids Club Afterschool Student Questionnaire (CDC, 2015c; Kelder et al., 2005; National Heart Lung and Blood Institute, 2013) and had additional items about how often certain behaviors that are linked to childhood obesity prevention were performed (Appendix A). Demographic data were collected from the participants using this survey.

Twelve of the items concerning dietary consumption behaviors that were included in the survey were analyzed to address the purpose of this study. The twelve behaviors were measured by the number of days performed in the past week, using an 8-point scale ranging from 0 to 7 days (Appendix C). The survey included dietary questions about fruit intake, vegetable intake, water intake, soda/sugar-sweetened beverage intake, non-sugary cereal intake, wheat/multi-grain bread intake, and breakfast intake. The mealtime behavior regarding the frequency of reading nutrition labels on food packages was also measured, using the same 8-point scale.

Data Analysis

Data for this study were analyzed using the Statistical Package for the Social Science Version 24.0. An a priori significance level was set at $< .05$, unless otherwise noted. Randomly missing data were estimated with imputation of the mean for the item based on participants'

gender. The twelve dietary consumption behaviors and the behavior of reading nutrition labels were analyzed for this study to ascertain whether a significant relationship exists between the frequency of performing the dietary behaviors and the frequency of reading nutrition labels. Descriptive statistics (e.g. means, standard deviations, percentages, medians) were calculated to summarize sample demographics. Spearman rho correlations were conducted to determine any significant relationships between the frequency of reading nutrition labels and the frequency of the twelve dietary consumption behaviors.

RESULTS

In total, 142 children were invited to participate in the original study. The response rate was 29.6%, resulting in a final sample size of 42 participants. The participants were primarily African-American (Figure 1), with slightly more 4th graders than 5th graders (Figure 2) and more girls than boys (Figure 3). The number of children who did not read any nutrition labels during the week was almost equal to the number of children who read nutrition labels every day of the week, with the largest number of participants reading nutrition labels seven days out of the week (Figure 4).

Relationships between the frequency of reading nutrition labels and the twelve dietary behaviors are detailed in Table 1. Positive correlations were found between the frequency of reading nutrition labels and the following behaviors: eating fruit for breakfast; eating vegetables at lunch/dinner; eating whole grain/multigrain bread ($p < .05$); eating fruit for a snack; and eating vegetables for a snack ($p < .01$). As the amount of times that the children read nutrition labels increased, the amount of time they engaged in those dietary behaviors increased (Table 1). The frequency of reading nutrition labels was inversely related to drinking soda/sugar-sweetened beverages ($p < .05$).

The frequency of children reading nutrition labels was not significantly related to the frequency of several of the dietary behavior variables: eating non-sugary cereal for breakfast; eating something for breakfast; eating fruit at lunch or dinner; drinking 100% fruit juice; drinking low-fat or skim milk; and drinking water.

DISCUSSION

School-aged children reading nutrition labels more frequently was associated with an increase in eating vegetables at lunch and dinner, fruit for breakfast or as a snack, and whole grain/multi-grain breads. This may be because the children who consistently read nutrition labels were attempting to be health conscious individuals, and decided to eat more vegetables, fruits, and whole grain/multi-grain breads as "healthy" choices. Even though fruits and vegetables do not always have nutrition labels (depending on how they are packaged in the stores or presented to the children at home or at school), the children may have learned about healthy food choices from nutrition programs in school or from their parents and as a result understood that fruits and vegetables are generally considered to be healthy.

Simply reading the list of ingredients or the nutritional facts listed on the label of a container of soda/SSB indicates that those types of beverages contain little to no nutritional value, and many people consider them to be unhealthy beverage options that should be avoided (Beck, Takayama, Halpern-Felsher, Badiner, & Barker, 2013). This may partly explain why the frequency of reading labels was found to have an inverse relationship with drinking sodas/SSBs. Drinking sodas/SSBs not only adds a substantial number of calories to a person's diet (Stern, Piernas, Barquera, Rivera, & Popkin, 2014), but has also been associated with eating increased amounts of salty and sweet snacks that are high in calories (Bleich & Wolfson, 2015) and may contribute to childhood obesity. Soda intake is associated with increased levels of obesity in children (Beck, Tschann, Butte, Penilla, & Greenspan, 2014), so it would not be unusual for individuals who are striving to practice healthy dietary behaviors to drink sodas/SSBs less often.

Unlike soda/SSB consumption, the frequency of drinking water, low-fat or skim milk, and 100% fruit juice was not significantly related to reading nutrition labels more frequently. There are various possibilities as to why consumption of these beverages did not correlate with the frequency of participants reading nutrition labels.

Plain water is a beverage that has many health benefits (CDC, 2016) but it has no nutrients and no calories. Depending on the source of the water, there might not even be a nutrition label for consumers to read, which may explain why drinking water was not associated with reading nutrition labels. Low-fat and skim milks are also considered to be a healthy beverage (Beck, Takayama, Halpern-Felsher, Badiner, & Barker, 2013; De Pelsmaeker; Schouteten, & Gellynck, 2013). It is undetermined why these dietary behaviors did not correlate with the frequency of reading nutrition labels.

Some people consider 100% fruit juices to be a healthy beverage option because the juices are made from fruits and are marketed as “natural” (Beck et al., 2013; Munsell, Harris, Sarda, & Schwartz, 2015), which may explain why drinking them was not associated with reading nutrition labels. However, other children may be aware of the recommendations to drink 100% fruit juice in limited amounts due to its high sugar content. These mixed perceptions about 100% fruit juice consumption may explain the lack of a significant correlation with the frequency of reading nutrition labels.

It is recommended that children 4 to 6 years old drink no more than 4 ounces (1/2 cup) of fruit juice per day, and that children 7 years old and older drink no more than 8 ounces (1 cup) of fruit juice per day (Korioth, 2017). However, studies found that children often drink more than the recommended daily amount of 100% fruit juices (Beck, Patel, & Madsen, 2013; Ford et al,

2016). This may be because the children and their parents perceive that 100% fruit juices are healthier beverage options than sodas/SSBs (Beck, Takayama, Halpern-Felsher, Badiner, & Barker, 2013; Munsell, et al., 2015), so they do not see the need to limit juice intake. It is possible that there is not a relationship between the frequency of reading nutrition labels and the frequency of drinking 100% fruit juices because some parent and child consumers may assume the 100% juices are healthy choices, so they do not read the nutrition labels.

The two relationships with the strongest significance ($p < .01$) were found between the frequency of nutrition label reading and the frequency of eating fruits and vegetables as snacks. Furthermore, a significant relationship was found between the frequency of reading nutrition labels and the frequency of eating fruit for breakfast, but not between the frequency of reading nutrition labels and the frequency of eating fruit at lunch or dinner. The reasons for these findings are uncertain. It is possible that school-aged children have more control over choosing what to eat at breakfast and for snacks rather than choosing what to eat for lunch (often provided by school) or dinner (often provided by a parent). One possibility is that when deciding what to eat for breakfast and snacks, the children made a greater effort to read the labels to understand the contents of what they were eating and made healthier dietary choices. However, they may have had less freedom in choosing what to eat for lunch or dinner, so they did not make as much of an effort to learn what was in the foods and beverages because it was not within their power to change the foods and beverages being provided to them.

Even though the research results from this study did not find a significant relationship between the frequency of reading nutrition labels and the frequency of eating breakfast, other studies have found that skipping breakfast is associated with increased risk for childhood obesity

(Ford et al, 2016; Koo Hui, Abdul Jalil, & Talib, 2015). Consequently, more research is needed to explore the relationships between factors related to eating breakfast.

Most of the study sample were racial/ethnic minorities, primarily African-American, from socioeconomically disadvantaged households. The fact that many of the participants came from the same or a similar ethnic and socioeconomic background potentially influenced the research results. African-American children have been found to drink more 100% fruit juices than Caucasian children (Han & Powell, 2013), and children from socioeconomically disadvantaged households have been found to drink SSBs and 100% fruit juices more frequently than children from high-income households (Han & Powell, 2013). Most of the participants being African-American may have also impacted the soda consumption research results, because African-American children and adolescents have been found to drink less soda than their Caucasian peers, instead drinking more 100% fruit juices (Han & Powell, 2013).

The behaviors of the participants' parents may have also impacted some of the results. The beverages that parents drink, and their approval or disapproval of certain beverages, have been found to influence the beverage choices of their children (Lora, Hubbs-Tait, Ferris, & Wakefield, 2016; Van Lippevelde et al., 2013). In addition, if parents provide their child with certain beverages at home (e.g. sodas, SSBs, 100% fruit juices), it is more likely that the child will drink those beverages more frequently, both in and out of the home (Hebden, Hector, Hardy, & King, 2013). If the parents of the child participants frequently read nutrition labels, this may have impacted the number of times that the children read nutrition labels themselves. If those same parents did not frequently drink sodas/SSBs, it may help explain why there was an inverse relationship found between drinking sodas/SSBs and reading nutrition labels. It is also possible

that children who have parents who practice healthy eating habits would have easier access to healthy foods and beverages in their everyday lives. Children of socioeconomically disadvantaged parents drink more SSBs and 100% fruit juices than children from socioeconomically stable households (Han & Powell, 2013). Water is the healthiest beverage option, and is most always available to children but they might not consider it as a preferred beverage if their parents do not frequently drink it themselves or encourage their children to drink it.

Determining the level of understanding among school-aged children concerning the information provided on nutrition labels would be an important addition to these results. The frequency of children reading nutrition labels is only important if they understand what is written on them. Future research measuring the frequency children reading nutrition labels, their comprehension of nutrition label information, and their understanding of how the nutritional values relate to their health is needed.

An additional measure that may prove helpful for future studies would be to collect the dietary data over a 24-hour period rather than over the course of a week to reduce the risk of memory lapses and unreliable self-reported answers. When done correctly, 24-hour diet recalls have been found to be fairly accurate and feasible when collecting food and beverage consumption information from children (Baranowski et al., 2012; Yang et al., 2014).

Research is already being conducted and efforts are already being made by various educational programs to teach children about the importance of nutrition and how reading nutrition labels frequently is a beneficial habit to start at a young age. Some examples of

educational programs to teach children to interpret nutrition label information include Nutrition Detectives, Read the Label, and Brighter Bites.

Nutrition Detectives is a free-of-charge program for elementary school children that teaches children how to spot "clues" on nutrition labels to determine which foods and beverages are healthy choices, as well as identify deceptive marketing techniques that try to make certain foods and beverages more appealing to children. Data were collected from five separate 5th grade classes that participated in the Nutrition Detectives program, and significant improvements in the students' nutritional knowledge were noted, with girls earning higher scores than boys (Katz et al., 2014). Nutrition Detectives teaches children not only how to read nutrition labels but also what the information on the labels means, so future studies can feasibly use it as a tool to measure children's understanding of nutrition labels.

Read the Label is a program funded by the USDA that teaches children ranging from 9 to 13 years old how to read nutrition labels. This program also teaches children what information to specifically focus on when reading nutrition labels to help them make healthier dietary choices.

Brighter Bites is a program that provides families from socioeconomically disadvantaged neighborhoods with fresh fruits and vegetables. The fruits and vegetables are gathered via donations, and each bag of produce is distributed with recipes, healthy tips, and nutrition handbooks. This program also involves teaching the children nutritional information via co-op nutrition lessons at local schools.

Programs like Nutrition Detectives, Read the Label, and Brighter Bites can teach children why nutrition is important to healthy everyday living. If these programs are expanded to reach a

larger population, or if similar programs are created, more children may become knowledgeable on the topic of nutrition, and may influence them to make healthier dietary choices.

Limitations

There were limitations in this study that should be addressed. Because the sample size in the original study was small, consisted of a limited age group of school children, and was primarily comprised of African-American children, the generalizability of these results is limited. A larger sample size with a broader spectrum of races, backgrounds, and ages may have provided more results with increased generalizability to other populations. Future studies on this topic would benefit from using a larger and more diverse sample. The dietary consumption behaviors analyzed were limited to 12, and focused on the frequency that certain foods/beverages were consumed within the past week, but portion sizes were not measured.

The frequency that children read nutrition labels was measured, but the children's level of understanding the information on nutrition labels was not determined. Even though children may have learned how to interpret information on nutrition labels from previous educational programs in school, afterschool programs, or from their parents, this aspect of reading nutrition labels was not analyzed in this study and poses a limitation to these findings. Future studies involving children and nutrition labels would benefit from measuring both frequency and levels of understanding.

NURSING IMPLICATIONS

Nurses working in various healthcare settings may benefit from the results of this study and use the information in caring for their patients. Both children and their parents should be educated on the importance of healthy dietary behaviors for maximum effectiveness. While children may greatly benefit from learning about nutrition, reading nutrition labels regularly, and consuming healthy foods and beverages, they will have a much more difficult time making healthy dietary choices if their parents do not provide nutritious foods or beverages at home.

School, public health, and community health nurses may especially benefit from this information and may use it when providing health promotion education to patients. Nurses in different specialty areas can contribute to the fight against childhood obesity by advocating for support at the local, state, and national government levels. As mentioned earlier, there are multiple educational programs healthcare professionals can use to teach children and families about the potential health benefits of reading nutrition labels routinely.

School nurses can help reduce the risk and rates of childhood obesity by educating students on healthy behaviors (including reading nutrition labels) and nutrition. They can also help by creating a list for students that details the healthy food and drink options provided in the school cafeteria and help implement a school-wide nutrition education program. If students are taught that their school nurses are knowledgeable on nutrition, they may feel comfortable with making an appointment to discuss healthy dietary behaviors and ask questions about nutrition.

Public health and community health nurses can help reduce the risk and rates of childhood obesity by educating both children and their families on the importance of healthy nutrition. They can help implement nutrition education programs at after-school programs and

recreation centers for local children and adolescents. They can also educate parents on nutrition and encourage them to model healthy behaviors for their children (including reading nutrition labels routinely). Providing children and their families with a list of healthy food and drink options and healthy recipe ideas may be beneficial as well.

Pediatric nurses in the hospital setting will likely be more focused on managing acute health problems than directly preventing obesity. However, they may also have opportunities to provide children and their families with educational material on nutrition and healthy dietary behaviors.

A large portion of nursing practice focuses on taking care of patients who are currently in need of care (i.e. secondary and tertiary prevention), but patients may greatly benefit from an increase in health promotion programs and educational materials to prevent a disease or disorder from occurring in the first place (i.e. primary prevention). These measures may not only result in a greater number of healthy children residing in the U.S., but also a greater number of children who grow up into healthy adults with less complex health problems and comorbidities.

CONCLUSION

This study identified significant relationships between the frequency of reading nutrition labels and several dietary behaviors that are linked to childhood obesity. These findings suggest that reading nutrition labels frequently may influence children to make healthier dietary choices, but more intervention research is needed to determine the direct effects of reading nutrition labels on childhood obesity. A better understanding of the relationships between reading nutrition labels and specific dietary behaviors in children is needed to guide the development of interventions and policies that may help prevent and manage childhood obesity. There is currently a gap in the knowledge regarding whether reading nutrition labels more often results in children engaging in healthy dietary behaviors more frequently. More research is needed to help fill this gap and try to improve the quality of life for children across the country and for children of future generations.

APPENDIX A:
FIGURES

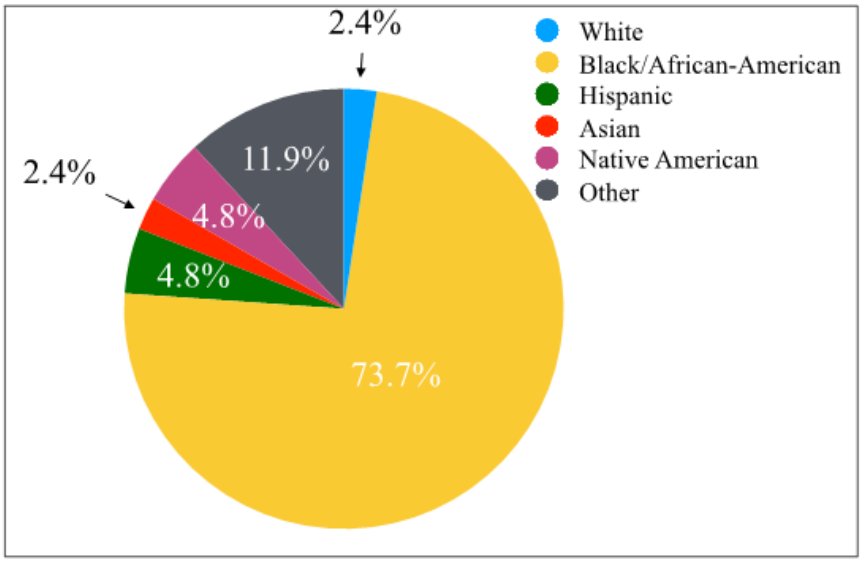

Figure 1: Race/Ethnicity (n = 42)

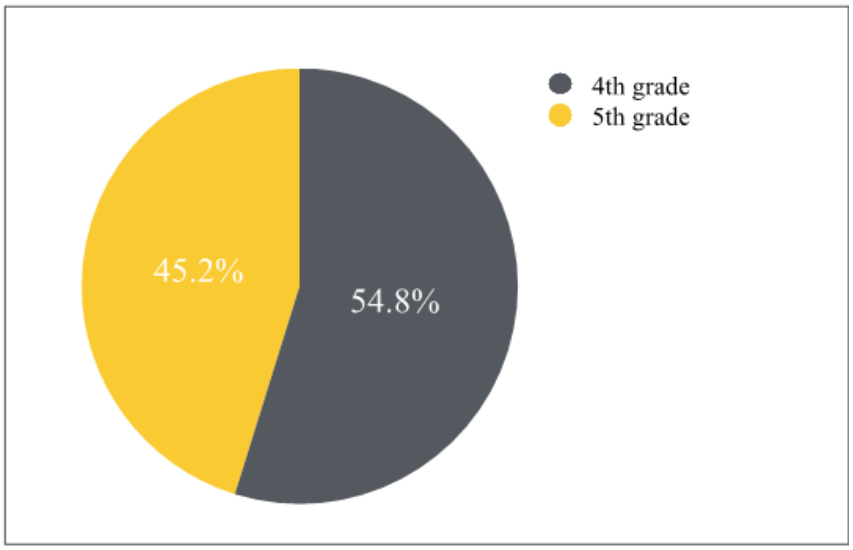

Figure 2: Grade Level (n = 42)

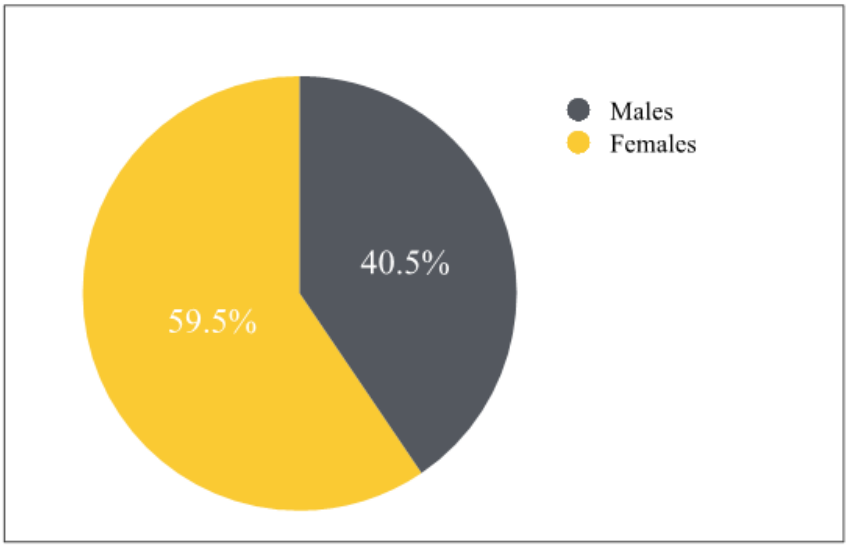

Figure 3: Gender (n = 42)

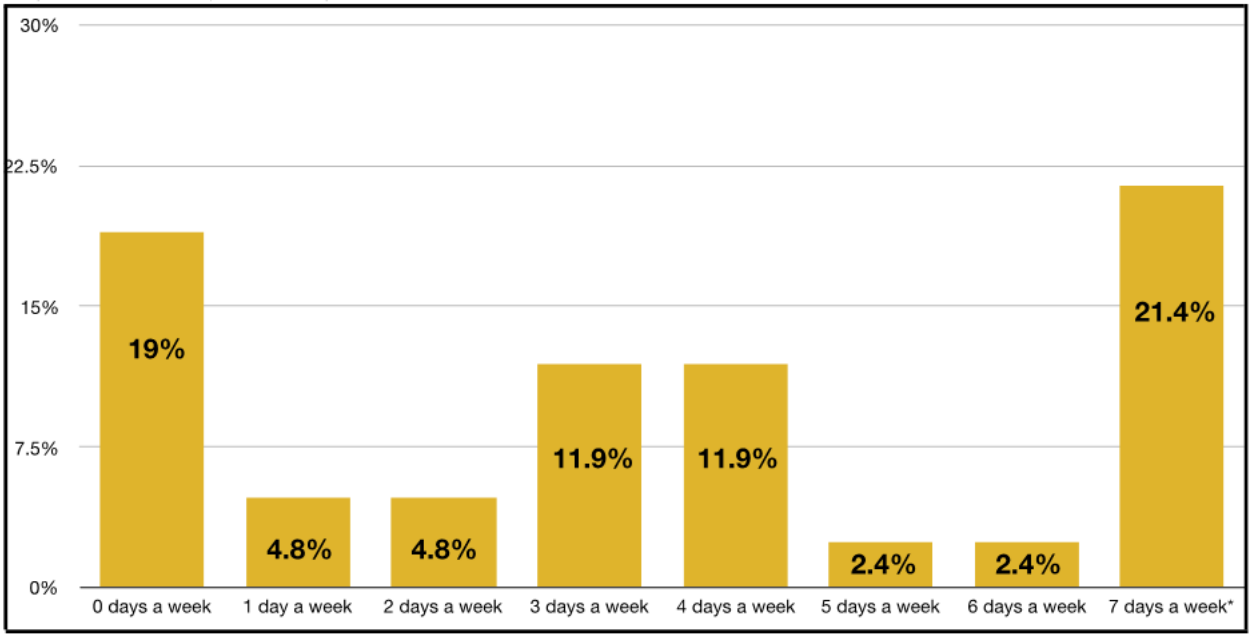

Figure 4: Frequency of Reading Nutrition Labels

*9 cases of missing data for this item were not included.

APPENDIX B:
TABLES

Table 1: Correlations between frequency of reading nutrition labels and dietary behaviors

Dietary Behaviors	Frequency of reading nutrition labels
Eating something for breakfast	.18
Eating non-sugary cereal for breakfast	.19
Eating fruit for breakfast	.36*
Eating fruit for a snack	.40**
Eating vegetables for a snack	.40**
Eating fruit at lunch or dinner	.27
Eating vegetables at lunch or dinner	.38*
Eating whole grain/multi-grain bread	.37*
Drinking soda/sugar-sweetened beverages	-.38*
Drinking 100% fruit juice	.15
Drinking low fat/skim milk	.10
Drinking water	.24

Spearman rho correlations: *p < .05; **p < .01

APPENDIX C:
ITEMS USED FROM BASELINE STUDY SURVEY

SNACTIVITY™
Glucose Simulator Survey

Please answer the following questions:

1. Are you a boy or girl? _____Boy _____ Girl
2. How would you describe yourself?

____ White

____ Black or African American

____ Hispanic or Latino

____ Asian or Pacific Islander

____ Native American, American Indian, or Alaskan Native

____ Other

Name _____

During the past 7 days, how many days:	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days	I don't know
Did you eat non-sugary cereal for breakfast?									
Did you eat something for breakfast?									
Did you eat fruit at breakfast?									
Did you eat fruit at lunch or dinner?									
Did you eat fruit as a snack?									
Did you eat vegetables at lunch or dinner?									
Did you eat vegetables as a snack?									
Did you drink 100% fruit juice?									
Did you drink low fat or skim milk?									
Did you eat whole wheat or multi-grain bread?									
Did you drink any glasses or bottles of water?									
Did you drink any soda (not diet soda) or other sugary drinks such as: kool-aid, sports drinks, and other fruit-flavored drinks?									
Did you read nutrition labels on food packages?									

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