University of North Carolina Asheville
Journal Undergraduate Research Program
Asheville, North Carolina
December 2014

Too Much with Too Little: Sugar and Artificial Food Dyes in Grocery Store Products Marketed To Children

Melissa Allen
Health and Wellness Promotion
The University of North Carolina at Asheville
One University Heights
Asheville, North Carolina 28804 USA

Faculty Advisor: Dr. Ameena Batada

Abstract

Overconsumption of sugar is a common problem among younger generations, and it is linked to various health issues, such as childhood obesity and type 2 diabetes, which have been on the rise over the last 30 years. The high consumption of sugars in Americans' diets is common despite multiple organizations' recommendations to limit daily intake of sugars. Two common recommendations are from the United State's Department of Agriculture (USDA) that recommends a limit of 25% of calories from added sugar, and the Institute of Medicine (IOM) that recommends a limit of 35% of weight from total sugars. However, products that meet one criteria may not meet another. This study compares the percentage of products marketed to children that exceed various recommended limits of sugars. Among products marketed to children, many are processed and contain various additives to preserve freshness or to add color. Concern over artificial food dyes has risen over the last few decades due to studies showing frequently-used food dyes to have harmful effect, such as hyperactivity, cancer, and allergic reactions. In 2008, because of the problem of hyperactivity, the Center for Science in the Public Interest petitioned the Food and Drug Administration to ban the use of these dyes. This research will examine the amount of food dyes in products marketed to children. Since artificial food dyes are commonly used in products with poor-nutritional value, this research also examined if there is an association of artificial food dye and higher level of sugars. Categories with the largest number of products was used for this analysis including: drinks (165 products), breakfast cereals (137), canned or packaged pastas (122), packaged cakes and cookies (102), poptart and frozen pastries (53), prepackaged lunches (44), and fruit snacks (43). Of these products, 47.22% exceed the 25% of calories coming from sugars recommendation and 17.59% exceed the 35% of weight from total sugars recommendation. Out of the products marketed to children used in this analysis (665), a total of 312 (47.92%) were considered to have a high (≥ 22.5g) sugar content and of those, 158 (50.64%) contained an artificial food dye. Out of the products marketed to children used in this analysis, 286 (43.01%) contained one or more artificial food dyes. Products high in sugars are more likely to contain artificial food dyes than products containing low/medium levels of sugar, an association that is statistically significant according to a Chi-Square test of proportions (p=0.02).

1. Introduction

Good nutrition is critical for the normal growth and cognitive development in children[1]. Despite the importance of good nutrition, in America only 2% of children consume the daily nutrients that the U.S. Department of Agriculture (USDA) recommends[2,3]. High-sugar and high-fat foods are over-consumed while fruits, vegetables and whole grains are under-consumed. This trend has caused many health concerns in the American population, especially in children. Over the last 30 years, the rates of obesity have doubled in children and tripled in teens[4].

Among the many factors that play a role in determining child nutrition and food choices, an important step in ensuring a healthy diet is the purchasing of food at the store. Processed and packaged foods are known to be less

healthy for kids than whole food items. However, most products that are marketed towards children are packaged, processed, and nutrient-poor. U.S. food and beverage companies spend $870 million per year in marketing targeting children. However, less than $40 million is used to market healthier fruits, vegetables, and dairy products to children[5]. Studies show that the specific marketing to children attract their attention, influence their foods choices, and promote the child asking their parents for these products[6].

Two additional contributors to poor diets of children are high sugar and artificial food dyes in products marketed to children in grocery stores. In light of other countries placing strict limits on sugar and some banning artificial food dyes, this calls into question if the U.S. standards should be reevaluated. This study looks at these two factors in products marketed to children.

Diets high in added sugars can lead to weight-gain, type 2 diabetes, and cardiovascular disease[12]. Studies show that added sugar consumption among American children exceeds the recommended limits by 18-28% of total caloric intake[7]. The increase of ready-to-eat breakfast cereals and other packaged foods are some of the many sources of children's excess sugar intake[8].

The intake recommendations for sugars vary across different government and non-profit health agencies. The Institute of Medicine's guidelines for sugar consumption recommends that less than 25% of an individual's daily calories come from added sugars. Previously, the USDA's standard for limits on sugars was more strict. In 2005, the USDA recommended that for a 2,000-calorie diet, only 8 teaspoons of sugars should be consumed, equivalent to a limit of 6.4% of calories from sugars per day. However now the USDA and The Center for Science in the Public Interest (CSPI) recommends that less than 35% of weight should come from total sugars. The American Heart Association (AHA) recommends limiting added sugars to under 100 calories per day, but in a study, the AHA found that children ages 4-12 years old consume an average of 21 teaspoons a day[14]. In the United Kingdom, the National Health Service recommends limiting sugars to less than 10% of daily calories. This limit is consistent with the international standard the World Health Organization (WHO) recommended in 2002.

Table 1. sugar intake recommendations among health agencies

Health Agency	Recommended Sugar Intake Limit
Institute of Medicine	< 25% of an individual's daily calories from added sugars
U.S. Department of Agriculture	< 35% of weight from total sugars
American Heart Association	< 100 calories per day from added sugars
National Health Service of the United Kingdom	< 10% of an individual's daily calories from added sugars

To gain a better understanding of how common children's products contribute to the excess sugar consumption, this study examined the amount of sugar in products marketed to children, and if they met the various current limits on sugar.

Another topic of interest in food products marketed to children is artificial food dyes. Artificial food dyes have become a greater concern over recent years due to associations found between their consumption and some neurological disorders, such as ADHD, behavioral issues, and allergic reaction in children[9,10]. Some animal studies have also shown a correlation between the consumption of artificial dyes and certain cancers[8,11]. Artificial food dyes are tested and certified for safety through the U.S. Food and Drug Administration (FDA) and nine different colors are allowed in our diets under the FDA limits[20]. These artificial dyes are added to make food appear brighter, more fun, or healthier. However, the food commonly containing artificial food dyes are processed, packaged and contain little nutritional value[8]. To understand the extent to which artificial food dyes are contained in children's foods, this study investigates the prevalence of artificial food dyes in products marketed to children in the grocery store. To further understand what products marketed to children contain artificial food dyes, this study examined if the presence of artificial food dye is associated with higher levels of sugars.

The purpose of this study was to investigate the levels of sugars and artificial food dyes in grocery store products marketed to children. The following questions were examined:

1. What percentage of grocery store products marketed to children meet or exceed daily sugars intake recommendations?
2. Is there a difference between percent of products that meet or exceed the various daily intake recommendations made by IOM, USDA, and the NHS of UK?
3. What percentage of products marketed to children would be labeled as having "high, medium, or low" levels of sugars?
4. What percentage of products marketed to children contain artificial food dyes?
5. Is the presence of artificial food dye associated with higher levels of sugars?

2. Methods

2.1 Study Design & Data Collection

A research team at UNC Asheville undertook a content analysis study to investigate various aspects of the marketing and contents of foods marketed to children in the grocery store from February to August 2014. The sample included all products marketed to children in one grocery store. Products that were eligible met at least one of the following criteria: contains cartoon characters on the package, contains a prize or incentive for purchase, has licensed character on the product, contains a "kids" size label of indication, is traditionally known to be a children's product, and contains bubble letter and bright colors.

The research team developed a coding sheet to take into the store and gather preliminary data on the products. The date, time, product name, product type, flavor/variety, package weight, shelf number from bottom, brand name, food company name, children product criteria, claims on front of package, and a space for notes was included in this coding sheet. The data were collected from February 24th through June 6th, 2014. Once preliminary data were collected in the store, nutrition information such as serving size, calories, macronutrients and and the ingredient list were gathered by visiting company sites online. When information was not available online, we went back to the store to collect the information.

2.2 Sample

A total of 972 products were found to meet the criteria of being marketed to children. For this paper, the specific analysis was concerned with the artificial food dyes and sugars in the categories with the highest number of products marketed to children. These categories were: drinks (165; 16.97%), breakfast cereals (137 products; 14.09% of total products), canned or packaged pastas (122; 12.55%), packaged cakes and cookies (102; 10.49%), poptart and frozen pastries (53; 5.45%), prepackaged lunches (44; 4.52%), and fruit snacks (43; 4.42%).

2.3 Main Variables Of Interest

The two main variables of interest in this study were sugar content and presence of one or more artificial food dyes.

2.3.1 sugar content

Sugar content of each product was calculated both as a percentage of weight and a percentage of calories per serving. Recommended sugars intake guidelines from the IOM, USDA, and the NHS of the UK, were used to compare product's sugar content to. The IOM's recommended limit is 25% of calories from added sugars however, total sugars was used to determine sugar content due to lack of information on added sugars versus natural sugars. To determine if a product exceeded the recommended limits, grams of sugar per serving were multiplied by the number of calories per gram of sugar, which is 4 calories/gram of sugar. Total calories per serving were then divided by calories of sugar per serving and calculated as a percent. To determine if a product exceeded the USDA recommended limit of 35% of weight from sugars, serving size was divided by grams of sugars per serving and calculated as a percent. If a product contained more than 24.9% of calories from sugars per serving, it was said to exceed the recommendation. If a product had more than 34.9% of it's weight from sugars, it was said to exceed the recommendation. The proportion of products that exceed these limits was compared for each of the biggest categories of products marketed to children.

As a third option, the NHS of the UK has put into place a "traffic light" labeling system to help consumers identify products with high, medium, and low sugar content. For this study, products were also categorized as containing high (≥ 22.5g), medium (6-22.4g), or low (0-5.9g) sugar content per 100 grams, as the NHS of the UK describe.

2.3.2 artificial food dyes

Although all categories of artificial food dyes were coded for the larger project, this specific study only focused on Blue #1, Blue #2, Red #40, Yellow #5, Yellow #6, and Lakes. If "artificial color" was listed as an ingredient, without a specific FD&C name, the product was coded as containing artificial dye.

Researchers used an MS Excel spreadsheet to input the data and calculate descriptive statistics. A Chi Square Test of proportions was used to determine whether products high (≥ 22.5g) in sugars were more likely to contain artificial food dyes.

3. Results

3.1 Total Products Exceeding Recommending Sugar Limits: IOM Vs USDA Recommendations

Out of the 665 products marketed to children in this analysis, a total of 314 (47.22%) products exceed the IOM recommended 25% of calories coming from sugars and a total of 117 (17.59%) exceed the USDA recommended 35% of weight from total sugars. In total, 431 (64.81%) products exceed one or both of these recommendations.

Figure 1. presents the percent of products that exceed the IOM limit of 25% of calories coming from sugars and USDA limit of 35% of weight from sugars for each product category. Categories are presented in order from most products (n=165) to least (n=43). All (100%) fruit snacks exceed both limits. Five of the seven total categories had more than a quarter of their products exceed the IOM limit of 25% of calories from sugars: fruit snacks (100%), drinks (83.03%), breakfast cereals (78.83%), Poptart and frozen pastries (71.15%), packaged cakes and cookies (68.63%), prepackaged lunches (45.45%). Breakfast cereals (40.15%; 78.83%) and packaged cakes and cookies (50%;68.63%) have the highest percent of products exceeding both recommended limits. In general, more products (47.22%) exceed the 25% of calories than the 35% of weight recommended limits.

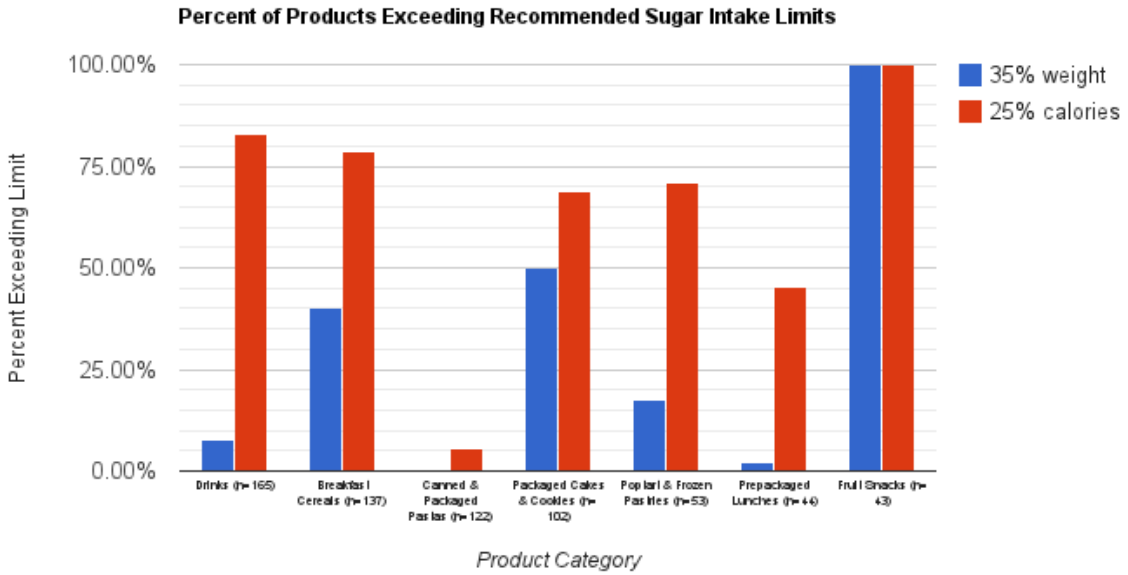

Figure 1. Chart comparing percent of products that exceed the IOM limit of 25% of calories from sugars and the USDA limit of 35% of weight from sugars , by product category.

3.2 Percent Of Products That Fall Into Low, Medium, And High Sugar Content Categories

For this analysis, products were categorized as containing high (≥22.5g), medium (6-22.4g), or low (0-5.9g) sugar content per 100 grams. This study used the standards set by the NHS of the UK to determine high, medium, and low sugars content due to lack of similar categorical standards in the United States. Out of the 665 products marketed towards children used in this analysis, a total of 312 (47.92%) had a high sugar content, 220 (33.08%) had a medium sugar content, and 133 (22.00%) had a low sugar content.

Across product categories the majority contain high levels of sugar (22.5g+). All (100%) fruit snacks have high sugar. As Figure 2. shows, among breakfast cereals, 75.91% of products have high sugar, 21.17% have medium sugar, and 2.92% have low sugar. Among Poptart and frozen pastries, 75.0% of products have high sugar, 21.15% have medium sugar, and 3.85% had low sugar. Among packaged cakes and cookies, 95.10% products have high sugar, 4.90% have medium sugar, and 0% have low sugar. Prepackaged lunches (18.18%), canned and packaged pasta (60.66%) and drinks (27.27%) have the largest proportion of products that have low sugar.

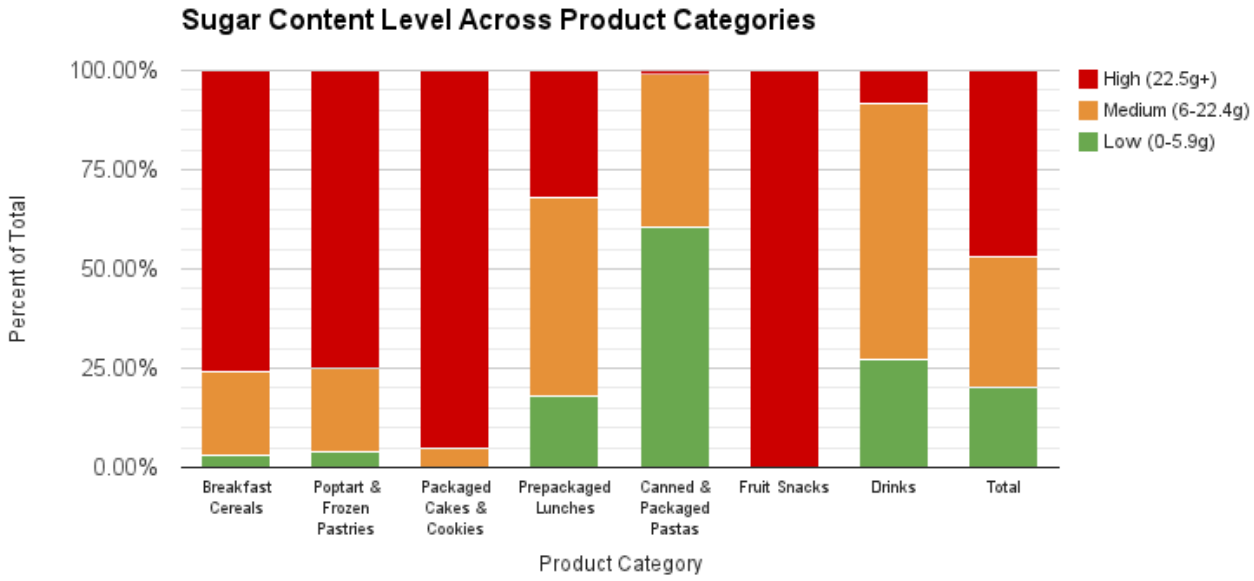

Figure 2. Chart showing percent of each product that falls into the low, medium, or high sugar content categories.

3.3 Products Containing Artificial Food Dyes

Out of the 665 products marketed towards children, 286 (43.01%) contain one or more artificial food dyes. Across categories, fruit snacks (95.35%), poptart and frozen pastries (71.15%) and prepackaged lunches (50.0%) have the highest frequency of artificial food dyes. Other categories, packaged cakes and cookies (34.31%), canned and packaged pastas (33.61%), and drinks (41.82%) have more than 25% of products containing food dye. Breakfast cereals (21.93%) is the only category that has less than 25% of products containing an artificial food dye.

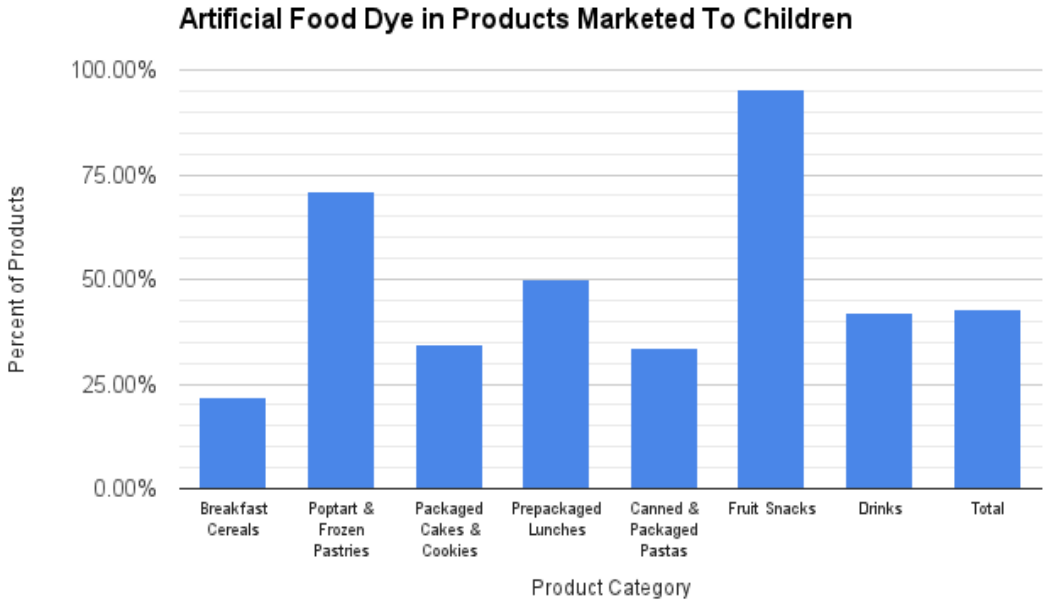

Figure 3. Bar chart showing the percent of products that contain one or more artificial food dye, by category

3.4 Association Of Artificial Food Dyes And Sugar Content In Products

Of products that have high sugar content (312), 158 (50.64%) contain an artificial food dye. Of products that have medium sugar content (220), 80 (36.36%) contain an artificial food dye. Of products that have low sugar content (133), 48 (36.09%) contain an artificial food dye.

As Table 2. indicates, of breakfast cereals that contain artificial food dye (n=41; 41.82%), 87.80% have high sugar content, 12.20% have medium sugar content and there were no products with low sugar. Of the poptart and frozen pastries that contain artificial food dye (n=37), 70.27% have high sugar content, 24.32% have medium sugar content and 5.41% have low sugar content. Of the drinks that contain artificial food dye (n=61), 14.49% have high sugar content, 36.23% have medium sugar content and 49.28% have low sugar content. Of the fruit snacks that contain artificial food dye (n=41), 100% have high sugar content. Of the packaged cakes and cookies that contain artificial food dye (n=35), nearly all (97.14%) have high sugar content and 2.88% have medium sugar. Prepackaged lunches with artificial food dye (n=22) are almost equally divided between having high sugar (45.45%) and medium sugar content (54.55%). Of the total canned or packaged pastas with artificial food dye (n=41), 2.44% have high sugar content, 68.29% have medium sugar content and 29.27% have low sugar content. Canned or packaged pastas is the category to have the least amount of products with artificial food dye that was high in sugar also.

According to a chi square test of proportions, the difference in all sugar levels (low, medium, high) between products with food dye and without was not statistically significant at the .05 level (p=.08).

Table 2. percentage of products that have low, med, and high sugar levels by product category and by whether the products contain artificial food dye or not.

	Low		Medium		High		Total	
Product Category	n	%	n	%	n	%	n	%
Breakfast Cereals (n=137)								
Sugar Content	4	2.92%	29	21.17%	104	75.91%	137	20.60%
With Food Dye (n=41)	0	0.00%	5	12.20%	36	87.80%	41	29.93%
Poptart and Frozen Pastry (n=53)								
Sugar Content	2	3.85%	5	21.15%	39	75.00%	52	7.97%
With Food Dye (n=37)	2	5.41%	9	24.32%	26	70.27%	37	69.81%
Drinks (n=165)								
Sugar Content	45	27.27%	106	64.24%	14	8.48%	165	24.81%
With Food Dye (n=61)	34	49.28%	25	36.23%	10	14.49%	69	41.82%
Fruit Snacks (n=43)								
Sugar Content	0	0%	0	0%	43	100%	43	6.47%
With Food Dye(n=41)	0	0%	0	0%	41	100%	41	95.35%
Packaged Cakes and Cookies (n=102)								
Sugar Content	0	0%	5	4.90%	97	95.10%	102	15.34%
With Food Dye(n=35)	0	0%	1	2.86%	34	97.14%	35	34.31%
Prepackaged Lunches (n=44)								
Sugar Content	8	18.18%	22	50.00%	14	31.82%	44	6.62%
With Food Dye(n=22)	0	0%	12	54.55%	10	45.45%	22	50.00%
Canned or Packaged Pasta (n=122)								
Sugar Content	74	60.66%	47	38.52%	1	0.82%	122	18.35%
With Food Dye (41)	12	29.27%	28	68.29%	1	2.44%	41	33.61%
Total (n=665)								
Sugar Content	133	20.00%	220	33.08%	312	46.92%	665	100.00%
With Food Dye(n=286)	48	16.78%	80	27.97%	158	55.24%	286	43.01%

A further analysis was conducted to determine whether the presence of food dyes is associated with high levels of sugars (22.5 g/100 g) versus all others (medium and low levels combined). As Table 3 indicates, 36.26% of products that have a low/medium sugar level also contain some artificial food dye, compared to 50.64% of products that have a high sugar level. According to a Chi-square test of proportions, this association is statistically significant at the 0.05 level (p=0.02), indicating that products that are high in sugar are more likely to contain artificial food dyes, than products with low or medium sugar.

Table 3. percentage of products in low/medium sugar vs high sugar that contain an artificial food dye.

	Low/Medium (22.5g or less/100g)	High Sugar Level (>22.5g/100g)
All products (N)	353	312
Products Containing Food Dye (%)	36.26%	50.64%

4. Discussion and Conclusion

This study revealed that 64.81% of products marketed to children exceeded one or more of the intake recommendations for sugars from various credible health organizations. This finding raises concern, as studies show a link between excess sugar consumption and metabolic abnormalities, obesity and hypertension, among other

conditions[12,13]. The U.S. Government's Dietary Reference Intakes recommend that added sugars not exceed 25% of total calories[14]. However, this study revealed that 47.22% of the products exceeded this specific recommendation. This study also revealed that nearly half of all the products (46.92%) had high sugar content, according to the UK categories. With childhood obesity at an all time high, it is of concern that such a large quantity of products marketed directly towards children are so high in sugar, which is a known factor in the cause of many health problems such as obesity. To support the reduction of over consumption of sugar and related diseases, food companies should reduce sugars to meet the strictest limit proposed for foods marketed to children.

One important consideration is that, for our analysis, sugar content was based off of total sugars in the product and not specifically added sugars. It is important for dietary guidelines to set an individual-specific limit on added sugars, but to do so, there also needs to be a way for consumers to identify added verse natural sugars. Currently, it is impossible for consumers to know how much added sugars they are consuming. In early 2014, the FDA proposed nutrition label changes that would include "added sugars" alongside sugars. This is a critical first step to helping consumers identify which products contain a higher amount of added sugar sweeteners verse products that contain natural sugars.

This study also investigated whether products marketed to children meet or exceed various standards set by government and non-profit health organizations. In 2006, the food industry created the Children's Food and Beverage Advertising Initiative (CFBAI) in response to concerns over what and how food is marketed to children. The initiative states it is "designed to shift the mix of foods advertised to children under 12 to encourage healthier dietary choices and healthy lifestyles"[15]. Some of the largest food companies voluntarily joined the initiative in which they agreed to have their products meet certain nutritional-criteria to then be acceptable to market towards children. However, some companies used different standards[16]. In 2011, the CFBAI began the development of uniform standards that would take effect in December 2013, but these standards are still different from the major sources consumers use for guidance, such as the USDA, IOM, and CSPI. Our data revealed that 42.77% of products exceeded the USDA's recommended limit of 25% of calories from added sugars but only 17.59% of products exceeded the IOM's recommendation of 35% of weight from sugars. This reveals a discrepancy between what products marketed to children are considered to meet or exceed recommended limits. Inconsistencies between the standards held by these organizations create confusion for the consumer concerned with making healthy choices for themselves and their family[17]. Specifically for sugar, if all companies would use the same standard for products marketed to children, it would help parents and other consumer's be able to make a more educated purchase and help address the confusing and mixed messages consumer's are getting from various sources on sugar recommendations. A policy that would require the major food companies to slowly change the percentage of sugars in their products each year to meet the strictest standard there is would reduce the amount of sugar intake by children. In addition, a policy requiring similar "traffic light" labeling as the UK for either High, Medium, or Low sugar content in products would address the continuum of scientific recommendations and opinions on specific sugar limits.

This study revealed that 43.01% of grocery store products marketed to children contained one or more artificial food dyes. Since artificial dyes are not essential for our food, and studies have shown some adverse health outcomes of consuming them, policy makers should ban US companies from using them in their products and companies should look for natural ways to color the food, such as using turmeric or beetroot. Other countries such as Great Britain have banned artificial food dyes and the European Union now requires a warning label on all dyed foods[8]. International food companies are already marketing artificial dye-free versions of their products in Europe, and in the US, few companies have began eliminating them from their products. For example, Yoplait yogurt company came out with Simply Go-Gurt in 2010, free from the artificial food dyes that were previously used. These are good examples of how food companies can make these changes to support the health of the children they are marketed to.

The CFBAI also does not have any standard limit for artificial food dyes. From previous data showing the negative health effects of artificial food dye on children, having an artificial food dye limit in the standards for products marketed to children would be highly recommended.

In this study, the relationship between frequency of artificial food dye and sugar content was examined. According to our research there does seem to be an association between food dyes and higher sugar. Though the sugar level and food dye frequency was not statistically significant when compared across the three categories of sugar (low, medium, high), there was a statistically significant difference when the low and medium categories were grouped together and compared to the high sugar category ($p=.02$). Our data suggests that if parents are buying products with food dye they are more likely to get products with high sugar content.

Our research results call into question the nutritional value of products that are marketed towards children. There should be concerns over the future of the children who are being specifically targeted by the food industry to consume more, consume often, and to eat only their packaged products. These types of advertising and marketing of

high-sugar foods and food with poor nutritional content to children are misleading and negatively influential to the children's food choices. Drawing children's attention to poor-nutritional quality foods is irresponsible and damaging to the child's long-term health. The influences of advertising may be especially pronounced in younger children, who have not yet developed the skills to critically evaluate the messages behind the ads. Reviews of research conducted by the American Psychological Association show that until the age of about 8 years old, children are unable to understand the persuasive intent of advertisements[18].

The Institute of Medicine of the National Academies states that "industry should develop and strictly adhere to marketing and advertising guidelines that minimize the risk of obesity in children and youth"[19]. Food companies have the power to promote healthy foods that could help change children's food preferences for the better. Regulation of marketing of foods high in sugar and containing artificial food dye is imperative to protect children's health. Food companies should adhere to a set of standards recommended by CSPI and other health organizations for responsible marketing to children. Policies that promote healthy foods and make them easier to identify in stores may increase demand for and supply of healthy food options, thus lowering costs for consumers and making it more desirable for major food companies to market these foods.

The limitations of this study include lack of information regarding how much sugar was naturally occurring in a product compared to the amount of added sugars. To properly determine if products exceeded the 25% calories from of added sugars recommendation, further research would need to be undertaken to identify what sugars are natural and what are added. Another limitation to this study was gathering data on products marketed to children from one store over a 6-month period, and thus the results may not be representative of all grocery stores. Future research that includes more grocery stores that are representative, and could examine a more inclusive list of products marketed to children. This future research would provide larger sample size for examining the relationship between sugar content and the presence of artificial food dyes.

With childhood diet related illness and disease on the rise in the United States, high-sugar consumption and artificial food dyes are two factors that need to be critically addressed. It is essential that food companies and government health organizations work together to support and protect the health of consumers. Food companies must be held to the strictest of standards across all categories to ensure the safety and high-nutritional quality of products that are marketed to children.

5. Acknowledgements

The author wishes to express her appreciation to faculty research advisor Ameena Batada for all of her help and support during this project. She would also like to thank student researchers Jennifer Roberts, Kelly Miller, and Kenett Melgar who helped collect and enter data for this project.

6. References

1. Nyaradi A, Li J, Hickling S, Foster J, Oddy W. "The Role of Nutrition in Children's Neurocognitive Development, from Pregnancy Through Childhood." *Frontiers In Human Neuroscience*. March 2013;7.

2. Munoz, Kathryn A., and Susan M. Krebs-Smith. "Food Intakes Of US Children And Adolescents Compared With Recommendations." *Pediatrics* 100.3 (1997): 323. *Academic Search Complete*. Web. 10 Sep. 2014.

3. Krebs-Smith, S., Guenther, P., Subar, A., Kirkpatrick, S., Dodd, K. (2010). Americans Do Not Meet Federal Dietary Recommendations. *The Journal of Nutrition.* Web. 10 Sep. 2014.

4. Ogden CL, Carroll MD, Kit BK, Flegal KM. "Prevalence of Childhood and Adult Obesity in the United States, 2011-2012." *Journal of the American Medical Association* 2014;311(8):806-814.

5. Botha, S., Fentonmiller, K., Jennings, C., Johnson, M., Young, K., Hippsley, H.,Vrabac, D. (2008). *Marketing food to children and adolescents. A review of industry expenditures, activities, and self-regulation. A report to Congress.* Web. 12 Sep. 2014.

6. Guidelines for responsible food marketing to children. Center for Science in the Public Interest; 2005.Web. 13 Sep. 2014.

7. Slining, M. M., and B. M. Popkin. "Trends In Intakes And Sources Of Solid Fats And Added Sugars Among U.S. Children And Adolescents: 1994-2010." *Pediatric Obesity* 8.4 (2013): 307-324. *Academic Search Complete*. Web. 9 Sep. 2014.

8. Kobylewski, Sarah, and Michael F. Jacobson. Food Dyes: A Rainbow of Risks. The Center for Science in the Public Interest., 2010. Web. 20 Sep. 2014.

9. Kanarek, R. (2011). “Artificial Food Dyes and Attention Deficit Hyperactivity Disorder.” *Nutrition Reviews*, 69(7), 385-391.

10. Stephenson, J., E. Songua-Barke, D. McCann, K. Grimshaw, K.M. Parker, M.J. Rose-Zerilli, J.W. Holloway, and J.O. Warner. "Chronic and Acute Effects of Artificial Colourings and Preservatives on Children's Behaviour." *Food Standards Agency*. Food Standards Agency, 2010. Web. 10 Sep. 2014

11. Borzelleca JF, Hogan GK, Koestner A. “Chronic toxicity/carcinogenicity study of FD&c Blue no. 2 in rats.” *Food Chem Toxicol.* 1985;23:551-558.

12. Johnson, RK, LJ Appel, M. Brands, BV Howard, M. Lefevre, RH Lustig, F. Sacks, LM Steffen, J. Wylie-Rosette, and American Heart Association Nutrition Committee of the Council on Nutrition, Physical Activity, and Metabolism and the Council on Epidemiology and Prevention. "Dietary Sugars Intake and Cardiovascular Health: A Scientific Statement from the American Heart Association." *Circulation* 120.11 (2009): 1011-020. *PubMed*. Web. 10 Sep. 2014.

13. Lustig, Robert H.Schmidt, Laura A.Brindis, Claire D. "Public Health: The Toxic Truth About Sugar." *Nature* 482.7383 (2012): 27. *MasterFILE Complete*. Web. 10 Sep. 2014.

14. “Dietary Reference Intakes Essential Guide Nutrient Requirements." *Institute of Medicine of the National Academies*. The National Academies, n.d. Web. 10 Sep. 2014.

15. "Children's Food and Beverage Advertising Initiative." *Children's Food and Beverage Advertising Initiative*. Council of Better Business Bureaus, n.d. Web. 13 Oct. 2014.

16. “Interagency working group on food marketed to children preliminary proposed nutrition principles to guide industry self-regulatory efforts.” Federal Trade Commission; 2011.

17. The Children’s Food and Beverage Advertising Initiative: a report on compliance and progress during 2011. Arlington (VA): Council of Better Business Bureaus; 2012

18. Kunkel D. et al. “Psychological Issues in the Increasing Commercialization of Childhood: Report of the APA Task Force on Advertising and Children.” Washington, DC: American Psychological Association, 2004.

19. Institute of Medicine. “Food marketing to children and youth: threat or opportunity.” Washington (DC): The National Academies Press; 2006.

20. Overview of Food Ingredients, Additives & Colors. (2010, April 1). Retrieved October 20, 2014.