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"You don't just eat 'em, you get match ready with 'em": A Content Analysis of Alcohol, Food, and Non-Alcoholic Beverage Advertising in the United States during the 2014 FIFA World Cup Brazil

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ABSTRACT

Noncommunicable diseases (NCDs) such as cardiovascular disease, diabetes, and cancers, are highly prevalent in the U.S. Their major risk factors include modifiable behaviors that are largely the result of the consumption of "unhealthy commodities." To address NCDs, research on population-level interventions is necessary, which includes regulations on the marketing of unhealthy food and beverages. This study examined the extent and nature of alcohol, food, and beverage advertising during cable and internet broadcasts in the U.S. of a large global sporting event, the 2014 Fédération Internationale de Football Association (FIFA) World Cup Brazil.

Using a purposive sample of recordings, ten broadcasts were reviewed for all commercial advertisements (ads). The overall prevalence of alcohol, food, and non-alcoholic beverage ads was calculated. One coder then determined the nutritional quality of the products and brands in the ads for food and non-alcoholic beverages using the Nutrient Profiling Index (NPI). Two coders scored the ads on measures of child-targeted marketing (CTM) and on violations to a generic version the Guiding Principles (GPV), the marketing code the alcohol industry currently uses. Food and non-alcoholic beverages were dichotomized as "healthy" or "less healthy" according to their NPI scores. Mean scores for NPI, CTM, and GPV were compared across the three groups of products using one-way ANOVAs and Pearson's correlations were calculated between the three measures within each product type.

Food and beverage ads (n=123) comprised 23.2% of all the ads identified during 10 broadcast recordings. Among those ads, 71.5% were found to be inappropriate for viewing

by children and adolescents based on NPI scores or because they were alcoholic beverages. The mean Child Targeted Marketing (CTM) score was significantly higher for less healthy food and non-alcoholic beverage ads compared to healthy ads (two-samples $t(84)=6.756$, $p<0.001$), but the mean Guiding Principles Violation (GPV) score was not (two-samples $t(84)=1.208$, $p=0.230$). One-way ANOVAs indicated that on average, food ads scored the lowest on the NPI, non-alcoholic beverages had the most CTM, and alcohol ads had the most GPV. For food ads, CTM and NPI were significantly correlated, indicating that less healthy ads were associated with greater CTM.

The findings indicate that unhealthy food and beverage products, including alcoholic beverages, are marketed during major sporting events like the FIFA World Cup. Most of these ads were found to be inappropriate for children and adolescents to view because they violated standard codes of practice. Greater public health surveillance is needed to protect the health of vulnerable populations.

INTRODUCTION

Corporate marketers have an exceptional opportunity to promote their products in sports broadcasts and expose millions of children, adolescents, and adults to "unhealthy commodities," such as alcoholic beverages and energy-dense, low-nutrient foods and non-alcoholic beverages, which are implicated in increased morbidity, mortality, and disability due to some of the most prevalent noncommunicable diseases (NCDs) today (Moodie, Stuckler, Monteiro, Sheron, Neal, Thamarangsi,…& Casswell, 2013; World Health Organization [WHO], 2014). Public health surveillance of advertising during sporting events with such large audiences is essential to fulfilling the mission of public health. This observational study aimed to improve capacity to conduct public health surveillance of food and beverage marketing, especially in sporting events where spectators may be exposed to a large number of unhealthy products through marketing techniques that target vulnerable populations, such as children and adolescents.

BACKGROUND

I. Non-communicable Diseases

NCDs refer to a set of chronic, noninfectious illnesses that are highly prevalent across the globe today. NCDs include cardiovascular diseases (CVDs), chronic respiratory diseases, cancers, and diabetes (WHO, 2015a). They are the leading causes of death, accounting for 68% of all deaths globally in 2012 (WHO, 2014). Of the 38 million deaths from NCDs in 2012, 16 million were premature, meaning below the average life expectancy, which is 70 years of age (WHO, 2014). In 2013 in the U.S., five of the top ten causes of death were due to NCDs (Centers for Disease Control and Prevention [CDC]/ National Center for Health Statistics [NCHS], 2013). Heart disease (a category of conditions under CVD) was the leading cause of death with 611,105 deaths or 23.5% of all deaths that year followed by malignant neoplasms (i.e. cancers) with 584,881 deaths or 22.5% (CDC/NCHS, 2013). Cerebrovascular disease (a type of CVD) caused 5% of deaths in the U.S. with 128,978 deaths, and diabetes mellitus caused 2.9 % or 5,578 deaths (CDC/NCHS, 2013). Mortality alone fails, however, to capture the true impact of NCDs. They cause considerable reduction in quality of life for individuals as well as economic losses due to high medical costs and lost productivity. For example, it has been estimated that cardiovascular disease cost the U.S. $444.2 billion in 2010, and if there are no new significant interventions over the next 20 years, the direct costs will increase 33%, and the indirect costs will increase 61%, totaling over one trillion dollars (Heidenreich, Trogdon, Khavjou, Butler, Dracup, Ezekowitz., ...& Lloyd-Jones, 2011). Given the magnitude of NCDs, public health recognizes the need for broad, population-level interventions that

target the risk factors for NCDs, slow the progression of the disease, and prevent complications due to the disease.

II. Modifiable Risk Factors

In 1993, *The Journal of the American Medical Association* published the pioneering article "Actual Causes of Death in the United States" by Michael J. McGinnis and William H. Foege. Reasoning that risk factors often interact in additive and multifactorial manners, McGinnis and Foege (1993) examined the attributable proportion of external, non-genetic risk factors for the top ten causes of death in the U.S. at the time. They reported the leading three causes of death as tobacco, diet and physical activity patterns, and alcohol, respectively (McGinnis & Foege, 1993). In an updated version, Mokdad, Marks, Stroup, and Gerberding (2004) reported that in 2000, the top three risk factors for death in the U.S. remained the same; however, given the trends, they predicted that poor diet and lack of physical activity will soon supplant tobacco as the leading cause of death in the U.S. Both articles acknowledge that these risk factors can be reduced to behavioral choices of individuals leading to Mokdad et al.'s (2004) label "modifiable behavioral risk factors." It is now an accepted fact that NCDs are caused by four modifiable risk factors: use or exposure to tobacco, harmful use of alcohol, lack of physical activity, and unhealthy diets. The rise of NCDs due to the four modifiable risk factors in the U.S. and across the globe is understood to be the consequence of societal shifts, particularly the aging population, globalization, and urbanization (Horton, 2015; Moodie et al., 2015).

Tobacco use or exposure (i.e. second-hand smoke) leads to various cancers as well

as cardiovascular and chronic respiratory diseases (WHO, 2015b). Annually, five million people die from tobacco use while another 600,000 die of tobacco exposure worldwide (WHO, 2015b). In the U.S., 480,000 adults die each year from tobacco, and smokers have triple the risk of all-cause mortality than their nonsmoking peers (CDC, 2015a). In the U.S., however, the prevalence of adult smokers continually decreased over the past three decades due to a broad set of population-based interventions, such as higher taxation, targeted-marketing regulations, and evidence-based cessation programs (Garrett, Dube, Trosclair, Caraballo, & Pechacek, 2011). From 2002 to 2008, there were declines in youth smoking for all races, ethnicities, and genders, except for non-Hispanic black males whose rate remained constant, albeit comparatively low (Garrett et al., 2011).

Harmful use of alcohol, whether through chronic over-consumption or through episodic binge drinking, is another chief risk factor for NCDs as well as for both intentional and unintentional accidents and injuries. In 2012, alcohol beverage consumption accounted for 5.9% of all deaths worldwide (WHO, 2015c). In young adults 20 to 39 years of age, alcohol consumption accounts for an estimated 25% of age-specific mortality (WHO, 2015c). According to the CDC (2014), in the U.S. where alcohol consumption is prohibited by law for individuals under 21 years of age, 12 to 20 year olds consumed 11% of the total alcohol consumed nationally, 90% of which was through binge drinking. Alcohol beverage consumption is estimated to account for 4,300 deaths and 182,000 emergency department visits in 12 to 20 year olds (CDC, 2014).

Physical inactivity and unhealthy diets both contribute to excess body fat (i.e. being overweight), obesity, and abnormal metabolic states, such as hyperlipidemia and

hyperglycemia, which in turn cause a myriad of NCDs such as diabetes and cardiovascular disease. The prevalence of overweight and obesity has been increasing for the past 30 years among all age groups worldwide. In 2014, among the world's adult population age 18 years or older, 39% were overweight (Body Mass Index (BMI) $\geq$ 25 kg/m^2 and < 30 kg/m^2), while 13% were obese (BMI $\geq$ 30 kg/m^2) (WHO, 2015d). These health conditions are attributed to 3.4 million annual deaths worldwide (WHO, 2014). In 2013, the U.S. adult population was 35.5% overweight and 28.3% obese (CDC, 2015b). The WHO (2015d) has estimated that 42 million children under the age of 5 years were overweight. Findings of the Framingham Heart Study, a large prospective cohort study, determined the age-adjusted relative risk for hypertension was 2.21 for obese men and 2.75 for obese women; the age-adjusted relative risk for diabetes was 2.12 for obese men and 1.42 for obese women; and the age-adjusted relative risk for cardiovascular disease was 1.46 for obese men and 1.64 for obese women (Wilson, D'Agostino, Sullivan, Parise, & Kannel, 2002). Furthermore, Sjöström, Narbro, Sjöström, Karason, Larsson, Wedel, ... and Carlsson (2007) found obese patients who received bariatric surgery experienced sustained weight loss and decreased overall mortality in 10 years of follow-up compared to obese controls who did not receive the surgery and did not have meaningful weight loss.

Overweight and obese children have higher risks of NCDs at earlier ages, leading to more years of disability, shorter life expectancies, and higher healthcare costs (WHO, 2015d). In the U.S. from 2011 to 2012, children's and teens' obesity prevalence ranged from 8.4% among children aged to 2 to 5 years, to 17.7% among children of 7 to 11 years, and to 20.5% among adolescents aged 12 to 19 years (CDC, 2015c). The prevalence of

obesity also varies between racial and ethnic groups within the U.S., which contributes to health disparities. Among the Hispanic population, the child and adolescent obesity prevalence is 22.4% compared to 20.2% for non-Hispanic blacks and 14.1% non-Hispanic whites (CDC, 2015c).

III. Nutritional Quality of Food and Beverages

While tobacco products and alcoholic beverages always contain the ingredients that lead to diseases despite their various forms and brands, food and non-alcoholic beverages cannot be understood in such a straightforward manner because their consumption is essential. Furthermore, strong debate among experts in the government, academia, and industry persists as to what constitutes an unhealthy diet as well as the amount that diet contributes to NCDs as compared to lack of physical activity.

Identifying a healthy diet is no simple task. The existing literature stresses multiple components to maintaining healthy weight or developing excess body fat, such as macronutrients, micronutrients, portion sizes, and overall consumptive behaviors. Among three cohorts with 4-year follow-up assessments, weight gain was positively associated with dietary intake of sugar-sweetened beverages, potato chips, and both unprocessed red meats and processed meats (Mozaffarian, Hao, Rimm, Willett, & Hu, 2011). Furthermore, there were strong negative associations between weight gain and dietary intake of fruits, vegetables, nuts, whole grains, and yogurt (Mozaffarian et al., 2011). Independent of diet, weight gain was positively associated with alcohol and tobacco use and negatively associated with physical activity among the lifestyle factors measured (Mozaffarian et al., 2011). In a study comparing popular diets for weight loss over one year, there was no

significant difference between groups restricting calories, restricting carbohydrates, restricting fats, or balancing carbohydrates, fats, and protein, but adherence, which was low, was positively associated with weight loss (Dansinger, Gleason, Griffith, Selker, & Schaefer, 2005). Moreno and Rodriguez's (2007) review of the literature concluded that children's food intake and above normal BMI was only associated with sugar-sweetened beverage consumption, and not with snacking, fast food consumption (high in macronutrients), or portion sizes.

Lobstein and Davies capture the difficulty of distinguishing between healthy and unhealthy foods and beverages, and everything in between, in their 2009 review of nutritional quality measurement methods, termed nutrient profiling. These measures are intended for package labeling and advertising regulations. One approach is categorical schemes, which are incapable of distinguishing less healthy products that make misleading health claims to appeal to consumers such as "reduced fat" (Kunkel, Castonguay, & Filer, 2015; Lobstein & Davies, 2009; Swinburn, Caterson, Seidell, & James, 2004). For instance, when fat is reduced in a product, sugar is often added to maintain palpability, and the total energy in kilocalories remains similar (Swinburn et al., 2004). Therefore, this type of health label is not only misleading but also highlights the subtle yet important distinction between *healthier* foods and *healthy* foods, of which only the second should be promoted to consumers (Lobstein & Davies, 2009; Rayner, Scarborough, & Lobstein, 2009). Better, alternative nutritional rating systems have been developed to classify energy density and nutrition in foods and beverages, such as the U.K.'s Office of Communication's (Ofcom) Nutrient Profile Model (NPM), which was designed to regulate

advertising during child-programing using a formula that credits points for good nutritional components and subtracts for poor nutritional components per reference amount of 100 grams of a product (Lobstein & Davies, 2009; Rayner et al., 2009). The NPM is the result of an expert panel's nutritional rating scale, which was then refined by the results of an online survey of professional nutritionists, who rated individual food items common in the UK diet (Rayner et al., 2009). It was created by the British Heart Foundation Health Promotion Research Group at Oxford University with the intention of developing an easy, applicable scale to determine products that can be marketed during children's programming or programming with a large proportion of audience members under age 16. Adapted versions of the NPM have been validated more recently for use in the U.S. for research, such as the Rudd Center's FACTS report series (Harris, LoDolce, Dembek, & Schwartz, 2015; Harris, Schwartz, Munsell, Dembek, Liu, LoDolce, Heard,…& Kidd, 2013) and in Australia and New Zealand for regulation of nutritional claims in marketing and labelling (Rayner et al., 2009). The final model includes negative points for energy, saturated fat, total sugar, and sodium and positive points for unprocessed fruits, vegetable, and nuts, fiber, and protein. The research group determined that total sugar was a good enough surrogate for added sugar and that protein was a good enough surrogate for iron, calcium, and omega-3 fatty acids (Rayner et al., 2009). Furthermore, on the basis of total negative scores and positive scores, protein scores are sometimes excluded from the positive score to prevent certain foods being inappropriately classified as healthy (Rayner et al., 2009).

Last in terms of distinguishing between healthy products that are often marketed to

children and adolescents but not necessarily deemed unhealthy using nutrient profiling like the NPM are sports drinks and energy drinks. The American Academy of Pediatrics' Committee on Nutrition (CON) and the Council on Sports Medicine and Fitness (COSMF) (2011) have declared these products inappropriate for children and adolescents. Energy drinks contain non-nutritive carbohydrates and stimulants such as caffeine, which carry a risk of abuse and even toxicity along with disturbances in sleep patterns and increased heart rate and blood pressure (CON & COSMF, 2011). Sports drinks are marketed as important sources of electrolytes to prevent dehydration after physical activity; however, such dehydration concerns in children after physical activity are rarely warranted and consumption could lead to excess caloric intake and weight gain over time (CON & COSMF, 2011).

Studies have shown varying results in the evaluation of the role of diet and physical activity in excess body fat, metabolic syndromes, and NCDs. In a 2-year follow-up study, there were no statistically significant differences among weight loss for groups receiving diet only, exercise only, or a combination of both diet and exercise. There was a trend for the diet-only group to lose more weight in the first year but in the second year the exercise-only group sustained the weight loss slightly better than the other two groups (Skender, Goodrick, Del Junco, Reeves, Darnell, Gotto, & Foreyt, 1996). In a large survey of over 100,000 10- to 16-year olds across 34 countries, overweight and obese children and adolescents were more likely to have lower activity levels and spend more time watching TV than their peers, while there was a negative association between overweight and obese status and sweets intake in 91% of the countries, leading the authors to recommend

focusing on physical activity only (Janssen, Katzmarzyk, Boyce, Vereecken, Mulvihill, Roberts,... & Pickett, 2005). Emphasizing the importance of unhealthy diet, Doak, Adair, Monteiro, and Popkin (2000) found that BMIs below and above the normal range can coexist within households across Russia, China, and Brazil suggesting both conditions can occur from the consumption of high-caloric, non-nutritious foods. Additionally, the highest proportions of these households were in urban environments for all three countries where unhealthy, processed food and beverage products are more readily available (Doak et al., 2000; Stuckler, McKee, Ebrahim, & Basu, 2012).

The debate over relative contributions of diet and physical activity is complicated by industry-sponsored research. Examining the results of systematic reviews and disclosed conflicts of interest, Bes-Rastrollo, Schulze, Ruiz-Canela, and Martinez-Gonzalez (2013) reported that reviews with conflicts of interest were five times more likely to report no positive association between sugar-sweetened beverages and weight gain compared to the systematic reviews without a reported conflict of interest. The authors concluded existing scientific evidence is likely biased by conflicts of interest with the food and beverage industries (Bes-Rastrollo et al., 2013).

IV. Corporate Activity

With the exception of physical activity levels, modifiable risk factors of NCDs can be narrowed to the consumption of "unhealthy commodities" (Moodie et al., 2013). As Richard Horton (2015) so aptly explains: "NCDs are 'lifestyle diseases,' driven by the products of legal (if not loved) multinational corporations. They are the by-products of our freedoms, unfortunate but inevitable consequences of human advance." Given the

American ethos of personal rights and autonomy, the public health community is challenged with addressing a massive, global problem without trampling the freedoms of both individuals and business. Therefore, public health surveillance is essential to monitor activities of multinational corporations whose products are causing NCDs and to respond when corporate activities are unlawful or damaging to society.

In classic infectious disease epidemiologic terms, NCDs are an "industrial epidemic" in which the producers of unhealthy products, specifically multinational and transnational corporations, are the disease vectors. This means the corporate entity is responsible for transmitting the disease-agent, such as alcohol, sugar-sweetened beverages, and high-calorie, low-nutrient foods, to hosts across various environments (Jahiel, 2008; Moodie et al., 2013). Yet, these corporations and their products differ from biologic vectors and their infectious agents in a key way, requiring public health interests to develop different strategies to address NCDs than those used to stop an infectious disease epidemic. Unlike viruses, commodities and the corporations that produce them are valuable to society and highly connected to the environment in which their diseases are spread (Jahiel, 2008).

Moreover, given the very nature of multinational and transnational corporations, which is to continually maximize their profits for shareholders, it may not be possible for corporations to be at harmony with those invested in the public's health (Hastings, 2013; Jahiel, 2008; Moodie et al., 2013). In his 2013 book *The Marketing Matrix: How the Corporation Gets Its Power—And How We Can Reclaim It*, Gerard Hastings describes the insidious, wide-reaching effects of globalized corporate marketing on the greater public

good—a state of affairs that he dubs as "the marketing matrix." In Hastings's depiction, ever-expanding, profit-driven corporations push their products on consumers with pristinely crafted narratives rooted in the advances of scientific research in psychology that downplay, and often mask, a product's risk and harm. Further, corporate marketers work to secure political allegiances that ensure that policies are drafted in their favor, which can result in the skirting or bypassing of important regulations. For public health, the implications are particularly dire, as such "bottom line" profit goals dislodge the codes and concerns for health and safety (Hastings, 2013).

V. Corporate Marketing and Upstream Public Health Surveillance

a) Tobacco

The tobacco industry's activities over the past century serve as the perfect real-world example to illustrate Jahiel's (2008) corporate-induced diseases and Hasting's (2013) "marketing matrix." When the Master Settlement Arrangement of 1998 made the tobacco industry's internal documents publically available, corporate activities to undermine public health was confirmed (Bond, Daube, & Chikritzhs, 2010; Deyton, Sharfstein, & Hamburg, 2010). In the name of profits, the tobacco industry deliberately denied the addictiveness of tobacco and nicotine, interfered with research on tobacco's health effects, and targeted vulnerable populations such as adolescents and minorities through product design, packaging, and marketing (Hastings, 2013; Moodie et al., 2013). As poor diet and physical inactivity are predicted to replace tobacco as the leading cause of death in the United States (Mokdad et al., 2004), parallels between corporate activities of the food, beverage, and alcohol industries and that of the tobacco industry have been drawn

(Bond et al., 2010; Brownell & Warner, 2009; Jahiel & Babor, 2007; Moodie et al., 2013). While fundamentally different products, it is acknowledged that tobacco marketing restrictions should serve as an archetypal approach within in a broader set of public health interventions to change the physical and social environments that support consumption of unhealthy commodities and ultimately lead to NCDs.

b) Alcohol

Exposure to alcohol advertising among children and adolescents has been shown to positively predict the onset of drinking and increased consumption among individuals below the legal drinking age (Anderson, De Bruijn, Angus, Gordon, & Hastings, 2009) as well as favorable attitudes towards drinking and intoxication (Austin, Chen, & Grube, 2006). Hanewinkel, Isensee, Sargent, and Morgenstern (2011) determined that alcoholic beverage advertising is not a surrogate for exposure to any advertising or to other media features since the positive association between advertising exposure and underage drinking outcomes diminished when controlling for alcohol-specific advertising.

In the U.S., the alcohol beverage industry, followed more recently by the food and non-alcoholic beverage industries, has developed marketing codes of conduct for their member companies and corporations. However, the efficacy of self-regulatory codes and their enforcement are widely debated. The majority of studies suggest that stricter regulation is required. The U.S. Beer Institute Code was created in 1997 and updated in 2006 to provide the alcohol industry with a regulatory framework for their marketing and advertising activities, but studies have disagreed on the extent to which this self-regulation is followed and whether it is sufficient to shield youth from exposure. For example, high

rates of beer brand recognition by children and adolescents below the legal drinking age provide evidence of exposure to advertising despite the industry's self-regulatory codes (Ellickson, Collins, Hambarsoomians, & McCaffrey, 2005). Children, adolescents, and young adults are likely to be exposed to alcohol marketing in a variety of media outlets, such as print magazines with high youth readership (Rhoades & Jernigan, 2013), television broadcasts of National Collegiate Athletic Association basketball games (Babor, Xuan, Damon, & Noel, 2013), and more recently through the internet and social media (Jernigan, Padon, Ross, & Borzekowski, 2017). Others argue that the proposed advertising bans similar to tobacco's restrictions fail to capture other marketing techniques that are subtler than television commercials, such as logos in a sports stadium or in pre-game broadcasts (Adams, Coleman, & White, 2014). Meanwhile, a systematic review of longitudinal studies by Siegfried, Pienaar, Ataguba, Volmink, Kredo, and Jere (2014) questioned the quality of the available studies and whether advertising regulations actually reduce youth alcohol consumption. They concluded more evidence is required before recommending stricter marketing regulations (Siegfried et al., 2014).

c) Food & Non-alcoholic Beverages

The obesity epidemic among children and adolescents has guided public health researchers and practitioners to look for causes and solutions. Recognizing individual-level explanations are inadequate, they reason that population-level risk factors must be at work (Harris, Pomeranz, Lobstein, & Brownell, 2009; WHO, 2014). In 2006, the Institute of Medicine's systematic review of the relevant scientific literature concluded television advertising influences nutritional beliefs, food preferences, and purchase requests of

children aged two to eleven years and that the food products promoted to this group are mostly high in energy and low in nutrients. Using Neilson advertising data and a 2-week household food diary, Buijzen, Schuurman, and Bomhof (2008) determined that children's exposure to food advertising was associated with their consumption of the advertised food brands and of the advertised energy-dense food product categories but not overall food products in the Netherlands.

A voluntary, self-regulatory code created by the food and non-alcoholic beverage industry, the *Children's Food and Beverage Advertising Initiative* [CFBAI], was implemented in 2009 (Kunkel, Castonguay, & Filer, 2015; Shehan & Harris, 2015). While companies and TV networks differ in their interpretation of child-targeted marketing, many who participate in the CFBAI define it as advertising when at least 35% of the expected audience is between the ages of two to eleven years (Healthy Eating Research, 2015). Three major problems with the CFBAI are highlighted in the scientific literature examining its effectiveness at curbing childhood obesity.

First, the CFBAI is voluntary and there is no enforcement protocol for violating pledges. Several studies have assessed the frequency and content of advertising during children's television programing pre- and post-CFBAI implementation to evaluate whether such a self-regulatory code reduces children's exposure to unhealthy foods and non-alcoholic beverages (Kunkel et al., 2015; Shehan & Harris, 2015). However, these efforts have been limited by the varying, and thus imperfect, scales for nutrient profiling techniques used by researchers and public policy makers. While overall food and non-alcohol beverage television advertisements have decreased since 2004, the majority of

television commercials in 2014 were still for fast foods, candies, snacks, and sodas, with only 1% for fruits and vegetables (Shehan & Harris, 2015). Additionally, the total food and non-alcoholic beverage advertising on television in 2014 increased for adolescents aged 12 to 16 years (Shehan & Harris, 2015). In one experimental study, children exposed to fast food restaurants' advertisements for healthier options showed brand preference, which is the preference for that specific fast food restaurant, but did not make healthier choices (Boyland, Kavanagh-Safran, & Halford, 2015).

Second, it does not cover adolescents, aged 12 to 14 years, who are not only vulnerable to unhealthy food and beverage marketing but are also exposed to more marketing due to higher media consumption and have greater autonomy to choose the food and beverages they consume (Healthy Eating Research, 2015; Harris, Heard, & Schwartz, 2014). A cross-sectional survey of teens, aged 14 to 16 years, found a statistically significant positive association between amount of TV watched and positive perceptions of fast food consumption consequences as well as a significant negative association between amount of TV watched and negative perceptions of fast food consumption consequence (Russell & Buhrau, 2015). Hence, CFBAI pledges by corporations to not market to populations under twelve years of age are likely overlooking another large vulnerable population.

Third, the CFBAI does cover TV programing intended for older audiences nor large TV events during which the audience may be large enough that more children and adolescents are watching but are still less than 35% of the total audience. One study found that of the top ten programs where children were exposed to food and beverage

advertising, half the programs had an audience composition of less than 30% children and therefore, were not covered under CFBAI pledges (Dembek, Harris, & Schwartz, 2013).

VI. Marketing in the Context of the FIFA World Cup

Corporate marketers of unhealthy commodities have benefited from large sporting events in two ways. First these events provide an outlet with a large population for brand or product promotion. Furthermore, sport sponsorships fall under the guise of corporate social responsibility. While promoting their products and garnering loyal customers who link their favorite sports teams to the brand or product, corporations can link their unhealthy products to themes like health, fitness, excellence, and success, which are ultimately incongruent with consumption of the product (Hastings, 2013; Lindsay, Thomas, Lewis, Westberg, Moodie, & Jones, 2013; Maguire, Barnard, Butler, & Golding, 2008). This is especially deleterious to public health efforts to address NCDs.

The FIFA World Cup is an international soccer (often referred to as "football" outside the U.S.) tournament, which is viewed worldwide on television and through web-based live streaming. During the 2010 Men's World Cup in South Africa, an estimated 3.2 billion people across the world watched at least part of one broadcasted match (Voigt, 2014, June 12). During the 2014 final match between Germany and Argentina, the ABC broadcast in the U.S. alone received over 17 million viewers (Humes, 2014, July 14). Due to its large audiences of all ages, 2014 World Cup broadcasts provide insight into the extent of targeted promotion of unhealthy products via television advertising in the U.S.

PURPOSE AND RESEARCH QUESTIONS

The purpose of this study is to examine television advertising for potentially unhealthy products during the 2014 Fédération Internationale de Football Association (FIFA) World Cup Brazil that were broadcasted in the United States. Based on corporate profit motives and the growing body of evidence that self-regulated marketing codes for unhealthy commodities are ineffective, critical examination of such an event is essential for fulfilling the mission of public health, protecting vulnerable populations, and stopping the now global NCD epidemic.

To determine the prevalence and the content of commercial advertisements for unhealthy commodities during the 2014 FIFA World Cup broadcasts, this study attempts to answer the following research questions:

Q1: What proportion of commercial advertisements (ads) broadcasted during the 2014 FIFA World Cup promote alcohol, food, and non-alcoholic beverage products or brands?

Q2: Of the alcohol, food, and non-alcoholic beverage ads, how many promote unhealthy products (i.e. energy-dense, low-nutrient food and beverages, and alcoholic beverages)?

Q3: Is there an association between the ads' content (child-targeted marketing themes and violations of a generic *Guiding Principles*) and the advertised products' nutritional quality?

Q4: Do the advertisements for food, non-alcoholic beverage, and alcohol products and brands differ in content?

METHODOLOGY

I. Research Design

This study used a cross-sectional, observational design to determine whether the nutritional quality of food, non-alcoholic beverages, and alcoholic beverages marketed in commercial advertisements (ads) during the 2014 FIFA World Cup broadcasts in the U.S. were associated with marketing techniques that target vulnerable populations, particularly children and adolescents under twelve years of age. First, all ads from a sample of ten broadcast recordings were recorded to calculate the frequency of ads promoting food, non-alcoholic beverage, and alcohol products or brands. Second, a content analysis of the food, non-alcoholic beverage, and alcohol ads was performed using the U.K. Ofcom's *Nutrient Profiling Model* (NPM) (Rayner et al., 2009), the *Qualitative Characteristics of Child-Targeted Marketing* (*Qualitative Characteristics*) (Healthy Eating Research, 2015), and the International Center for Alcohol Policies'(ICAP)/International Alliance for Responsible Drinking's (IARD) *Guiding Principles for Responsible Marketing Communications for Beverage Alcohol* (*Guiding Principles*) (2011). The scores for the ads' nutritional quality was correlated with measures designed to estimate child-targeting marketing techniques and the number of *Guiding Principles'* violations.

a) Data Sources

The alcohol marketing research team at the Department of Community Medicine and Health Care at the University of Connecticut's School of Medicine, under the leadership of Dr. Thomas Babor, recorded the broadcasts of matches for the 2014 FIFA World Cup Brazil, which aired between June 12, 2014 and July 13, 2014 on cable or live

online streaming. For each match, which was broadcasted in the Hartford, CT-area, one researcher was instructed to record the entire match continuously, beginning at least 30 minutes before the match started (during the pre-show) until at least 30 minutes after the match ended (during the post-show). Therefore, all recordings included the pre-and post-match shows, the match, and the halftime, except in some cases which were due to technical difficulties, such as when the recording was set to stop at a certain time but the match went into overtime, therefore the post-show broadcast was not captured.

b) Sampling Plan

For the purposes of this study, ten broadcast recordings were chosen in reverse chronological order starting with the final match broadcast, proceeding to the third-place match broadcast, then the two semi-final match broadcasts, and so forth. This purposive sampling scheme was chosen because such broadcasts, which occurred during the tournament round of the World Cup, were likely to have the largest audiences, the greatest expenditure by corporate marketers, and the least amount of "spot ads," which are viewed by small populations who share cable providers in a small geographic region. Since two matches were aired at the same time during the qualifying round of the World Cup, the audiences were smaller and several broadcasts could not be recorded by the research team. The Brazil versus Colombia quarter final match was excluded from the sample because it was recorded from ESPN On Demand. ESPN On Demand replayed the matches without any ads so it did not accurately reflect the live broadcasts. Of the ten broadcasts, seven were complete, two were missing post-shows, and one was missing its pre-show. The broadcasts were aired on ABC (n=2), ESPN (n=5), ESPN2 (n=1), and ESPN Watch (n=2).

All broadcasts were stored on a cloud storage network in a private account with access limited to the research team.

The promoted brand and product for every ad was recorded and frequencies of ads for food, non-alcoholic beverages, and alcohol were calculated. Then a sample of all unique ads that marketed products or brands for food, beverages, or both was identified. The inclusion criterion for this sample was unique ads marketing a food or beverage (alcoholic and non-alcoholic) product, set of products, or brand. Ads were excluded if a single nutrient profile index (NPI) score could not be estimated. One spot ad from the original sample, which advertised Big Y, a grocery store chain, was excluded from the content analysis because its range of products are too wide and therefore, categorization of its featured products and its cumulative NPI score could not be accurately calculated.

c) Data Collection Procedures

Every ad that aired during the recorded broadcasts was reviewed by one coder. For every ad, the product, brand, sub-brand, match, broadcast segment (i.e. pre-show, halftime, etc.), and a brief description were identified and recorded in a database using IBM SPSS Statistics for Windows, Version 24.0 (Armonk, NY, USA). Broadcast recordings were played using Apple Inc. QuickTime Player, Version 10.4 (Cupertino, CA, USA) or Microsoft MovieMaker, Version 2012 (Redmond, WA, USA), which allowed the coder to pause or rewind broadcasts when necessary. The coder also gave each unique ad an identifier and a description to calculate the frequency of unique ads that were aired within the 10 broadcasts and to select the sample of food, non-alcoholic beverages and alcohol ads. Additionally, each ad in the sample was abstracted from the broadcast recordings as an

individual video file for content coding. The sample's video files were uploaded and stored to the cloud storage network for accessibility by both content coders.

To calculate the NPI score for each ad in the sample of unique food and beverage ads, the coder collected nutrient values from publically available nutritional facts from the brand's website when available. Since alcoholic beverages are not required to have nutritional labels, standard nutritional content for Corona Extra, Bacardi Superior, and Guinness were not available on the brand's website. Hence, the nutritional values were provided upon request via email for Corona Extra (K. Cizmar, personal correspondence, March 28, 2016) and telephone using the consumer information hotline for Bacardi Superior. The nutritional values for Guinness were obtained from a can of Guinness Draught at a liquor retailer in Connecticut. For McDonald's fountain sodas, the researcher contacted the company's consumer information telephone line; however, the representative did not have the information requested. Nutritional content was drawn from the brand's website but reflects the formulation that is in a can or bottle rather than the fountain version.

The NPM requires beverages, which are measured in fluid ounces in the U.S., to be converted to 100g. Thus, each beverage's serving size was converted to grams using specific gravities provided online by the Food Standards Australia New Zealand ([FSANZ], 2011a & 2011b). These specific gravity values are based on types of beverages or liquid ingredients rather than brand-specific values. All relevant nutritional values were entered into an Excel spreadsheet provided by the Rudd Center for Food Policy and Obesity at the University of Connecticut to convert nutrients per serving size into nutrients

per 100g and then the original UK Ofcom's NPM score as well as the Nutrient Profiling Index (NPI) score.

Violations for the *Guiding Principles* (GPV) and number of *Qualitative Characteristics of Child-Targeted Marketing* (child-targeting marketing [CTM]) were determined by two coders. To guide the coders, a codebook was adapted from violations of the *Guiding Principles* from Babor et al. (2013) and Noel, Babor, Robaina, Feulner, Vendrame, and Monteiro (2017) along with the definitions of the nine CTM (Healthy Eating Research, 2015) with homegrown examples. The coders independently rated five ads and then discussed their scoring to further refine the codebook. After one round of rating, the coders independently rerated the ads a second time but with the original scoring by each rater in the first round. The final *Guiding Principle* violations and presence of CTM were determined by coder consensus by resolving any discrepancies.

II. Measures

a) Product or Brand Type of Each Ad

One coder recorded and categorized all ads that played during the ten broadcasts. The following operational definition was used to determine what constitutes and differentiates a particular advertisement. An ad lasts approximately 15 to 30 seconds and contains a similar theme for the same product, brand, or service. Ads are distinct from other marketing techniques employed during the broadcasts, such as the appearance of brand logos or an announcement of brand sponsorship. When ads for the same brand were played back-to-back, they were distinguished by whether different specific products and/or only the brand was promoted as well as whether the ad was aired at another time during the

10 broadcasts but not in sequence with the other ad of the same brand. The product, brand, sub-brand, the brief description, the broadcast during which it aired, the time within the broadcast in relation to the match (i.e. pre-show, halftime, etc.), and the channel from which it aired were recorded in the SPSS database.

Then according to product, brand, and sub-brand, the ads were categorized into one of four groups: food, non-alcoholic beverages, alcohol, and other. To achieve sufficient sample sizes and simplify data interpretation, ads that contained both food and beverages were assigned to the either the food or the non-alcoholic beverage categories based on their brands' main product. For example, the McDonalds' ads that featured food and fountain drinks were classified as food but Pepsi's ad, which prominently featured a bag of Lays' Original potato chips, was classified as non-alcoholic beverages. However, their nutritional values were still included in the nutrient profiling index score in an attempt to accurately capture the ads' nutritional quality. The "other" category included ads for services like a dental practice and products like vehicles. All unique ads for food, non-alcoholic beverages, and alcohol, made up the sample for content analysis (in what follows, unique ads will be referred to as the unweighted sample).

b) Nutrient Profiling Index Score

To assign a single score of healthfulness to each consumable product, the United Kingdom's Office of Communications' (UK Ofcom) Nutrient Profiling Model (NPM) along with the Rudd Center's score conversion, the Nutrient Profiling Index (NPI) were used. The NPI allows the score to be more easily interpreted on a scale from zero, which indicates the least healthy possible score, to one hundred, which indicates the healthiest

possible score. The NPM and the NPI assign a number from 0 to 10 for each of the following nutritional values: calories, saturated fat, total sugar, sodium, fiber, and protein as well as the products' percent composition of unprocessed fruits, vegetable, and nuts (%FVN) in 100 grams of a product, regardless of serving size (Rayner, 2009; Harris et al., 2013). The Rudd Center provided an excel worksheet to calculate the U.S. nutritional content into the values per 100g of the product, U.K. measurement conversions, the NPM's scoring, and the NPI score. For beverages, volumetric serving sizes in fluid ounces were converted first to milliliters and then to weight in grams using the specific gravities provided online to the public by FSANZ (2011a & 2011b). These specific gravity values are based on types of beverages or liquid ingredients rather than brand-specific values.

Since zero is assigned when the %FVN is less than or equal to 40 percent, it was assumed that most products had a zero rating except for salads, and possibly Subway sandwiches (J. Harris, personal communication, April 3, 2016). For Subway sandwiches, the percent by weight was calculated using the company's online consumer nutritional calculator. The weight of the sandwich without vegetables was first subtracted from the sandwich's weight with vegetables, which was then divided by the weight of the sandwich with vegetables. Subway's "turkey with Jalapenos on 9-grain honey oat bread" was closest to the 40% threshold with 39% vegetables by weight but no product in the sample scored at least one point for %FVN.

The values for energy (with calories converted to kilojoules), saturated fat, total sugar, and sodium were added to yield "A" points. To calculate the "C" points, a few rules were employed. If "A" points were 11 or more points, and if the %FVN were less than 5

points then the "C" points equaled the value for %FVN plus the value for fiber. If the "A" points are less than 11 or if the %FVN are greater than 5 points, then the "C" points equaled the sum of the values assigned for %FVN, fiber, and protein. The NPM is calculated by subtracting "C" points from the "A" points. Finally, the NPM is converted to the NPI by multiplying the NPM score by negative two and then adding 70.

When one single product was not advertised, all available information was aggregated for the most accurate surrogate. There were three types of ads that did not market a single product: ads that promoted their brands only, ads that promoted one product but included other branded products, and fast food restaurant ads that promoted a range of customizable products from their menus. When the ad was marketing the general brand rather than a specific product, as with two unique Coca-Cola ads in the sample, the nutritional data for classic Coca-Cola soda was used. For Gatorade and Powerade, which promoted their respective brands only, an average of all flavors of the brands' classic formulas were used, yet the nutritional content remained constant across flavors for both products, with the exception of Powerade for which five of the ten flavor varieties had an extra gram of total carbohydrates.

For ads with more than one product, the NPI was calculated for the combination of products, which depended on how the products are meant to be consumed, following the methods employed in the Rudd Center's *Fast Food FACTS 2013* (Harris et al., 2013). If the products represented alternative versions within a category of product types, then their nutritional values were averaged. But if the products were intended to be consumed together as components of a meal or snack, then the nutritional values were summed. For

example, Tecate and Tecate Light beers are advertised together in one ad from the sample. Since they are different versions of beer their nutritional values were averaged. In another example from the sample, the PepsiCo ad clearly showed a can of Pepsi with Real Sugar soda and Lay's Original potato chips, which are not the same type of product and are intended to be consumed together so their nutritional values were added to determine the overall NPI for that ad.

For customizable products such as sandwiches from Subway, the standard version of the sandwich was used as indicated on the company's website unless non-standard modifications were explicitly mentioned in the ad. For example, the voiceover in one of Subway's ads announces the Olympic swimmer Michael Phelps's favorite Subway sandwich is "turkey with jalapenos on nine grain honey oat bread." The nutritional content of this product was recorded as the standard vegetables plus jalapenos, and the standard 9-grain wheat bread was substituted with 9-grain honey oat bread. For Dunkin Donuts' Iced Coffee, Iced Latte, and Frozen Coffee Coolatta and Domino's Pizza's Specialty Chicken, for which all versions of a product were listed in a pdf file, the average of all versions was calculated. When the product consumed was unclear as with the medium fountain beverage shown in two of McDonald's ads, the average of all fountain beverages listed on the company's online nutritional information table was calculated.

Finally, two ads for McDonald's, such as the one for its Bacon Clubhouse Burger or Sandwich, required combining products within a category and then across categories. The ad showed an actor eating the sandwich and a medium serving of French fries, and promoted the three versions of the sandwich at the ad's conclusion; therefore, the three

versions of the bacon clubhouse sandwich, with crispy chicken, grilled chicken, or beef, were averaged. Then the nutritional information for the medium French fries was added to the sandwiches' average to yield a single NPI score.

c) Qualitative Characteristics of Child Targeted Marketing

The nine *Qualitative Characteristics of Child-Targeted Marketing* [CTM] (Healthy Eating Research, 2015) were coded as binary variables for each ad. If present, each characteristic received a score of one. The number of observed characteristics were totaled for each ad and compared across categories of the product types in the sample (food, non-alcoholic beverages, alcohol) (*similar to methods in* Harris, LoDolce, Dembek, & Schwartz, 2015). These characteristics, which are originally adapted from the Federal Trade Commission's definitions for child-targeted advertising by a panel of experts for the Healthy Eating Research (2015) include a range of marketing features from an animated brand mascot (e.g., Frosted Flake's Tony the Tiger) to overall themes that appeal to children such as "fun, cool, excitement, adventure, magic, or fantasy" for example.

d) Generic Guiding Principle Violations

The ICAP/IARD *Guiding Principles*, originally developed as a code of responsible advertising for alcohol products, were adapted to apply to a broader range of food and beverage products using the following procedures. First, we reviewed the Guiding Principle statements for their applicability to food and non-alcoholic beverage products, concluding that with slight modifications they described advertising practices that were not appropriate to a range of products. Second, we reviewed the procedures developed by Babor et al. (2008, 2013) to operationalize the Guiding Principles, making revisions in the

Likert scale items to make them more generic (e.g., referring to "consuming the product" rather than to "drinking the alcoholic beverage"). Of the 37 original, Likert scale *Guiding Principles'* violation (GPV) questions developed by Babor et al. (2008), 28 were adapted to have generic wording and applied to all ads in the unweighted sample. Subsequently, another eight violation questions were coded for alcohol products only because an adaptation was deemed inappropriate (e.g., "The ad shows one or more people in a state of drunkenness."). The coders responded to each *Guiding Principle* question using a five-point Likert scale with the following response options: strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree. Consensus coding of either agree or strongly agree indicated a violation of a *Guiding Principle* sub-guideline. Hence, an ad was determined to violate the generic version of the *Guiding Principles* when one or more sub-guideline violations were present.

e) Additional Content Variables

Lastly, the coders rated six additional variables derived from available guidelines and previous studies because they were considered relevant to messages about the consumption of potentially unhealthy commodities or indicative of child-targeted marketing. The coders rated perceived age in integer-years of the youngest person in the ad (Babor et al., 2013; Noel et al., 2017) in order to identify possible targeting of children and adolescents. Then they rated how much of the product or products the youngest individual was likely to consume in the ad's situation. Four options were used by the coders: under recommended dietary guidelines, within recommended dietary guidelines, above recommended dietary guidelines, and not applicable (if the ad did not show a person or if

the person shown was not consuming or intending to consume the product). The codebook emphasized that according to U.S. dietary guidelines, children and adolescents should not consume alcohol, energy drinks, or sports drinks. Perceived weight of the persons with the smallest and largest BMIs in the ad was coded using the options: underweight (BMI < 18.5), normal or healthy weight ($18.5 \geq BMI \leq 24.9$), overweight ($25.0 \geq BMI \leq 29.9$), obese (BMI > 30.0), or not applicable if there were no persons in the ad. Perceived activity level of the most and least active persons in the ad were rated using a scale adapted from metabolic equivalents of tasks (METs) with five options: sedentary (METs > 2.0), light ($2.0 \geq METs \leq 3.0$), moderate ($3.0 > METs \leq 6.0$), vigorous (METs < 6.0), and not applicable. Threshold values and examples of these coding categories were adapted from Ainsworth, Haskell, Herrmann, Meckes, Bassett, Tudor-Locke,…and Leon (2011) and Haskell, Lee, Pate, Powell, Blair, Franklin, ... and Bauman (2007).

III. Statistical Analysis

SPSS was utilized for the quantitative analyses conducted for this project. The frequencies of ads by product or brand type, which were food, non-alcoholic beverage, alcohol, or other, were calculated by recording all ads in the 10 recordings. Ads were weighted by the frequency of which they were broadcasted during the 10 recordings and then the food and non-alcoholic beverage ads were grouped by the Nutritional Profiling Index (NPI) score as either healthy or less healthy such that food rated below 64 and drinks below 70 were less healthy. Scores on CTM and GPV were compared using independent t-tests.

Since the scores were adapted from existing measures that were created and validated to assess particular product types, mean scores for NPI, CTM, and GPV were compared across the three groups of products (one-way ANOVAs) and then Pearson's r correlations were calculated between the three measures within each product type. Because the NPM is not a validated measure for alcohol products, only food and non-alcoholic beverages were included in the NPI analyses.

Pooled kappa statistics were calculated for the second round of coders' ratings for the CTM and GPV and based on the coders' agreement at the item-level of the particular measure. Intra-class correlations were used to quantify reliability of the coders for the additional content variables.

RESULTS

From the sample of 10 match broadcast recordings, 12 hours of non-match time broadcasting were observed during which 531 advertisements ($n_{unweighted}$=188) aired. Of the 531 ads, 23.2% were for food, non-alcoholic beverage, and alcohol products or brands ($n_{unweighted}$=123). Table 1 provides the length of non-match broadcasting time observed, the teams that played during the broadcasts, and the tournament round of the matches. Table 2 shows the frequency of both unweighted and weighted ads for food, non-alcoholic beverages, alcohol, and other types of products and services that aired during the matches in the sample.

Table 1: *Characteristics of the 2014 FIFA World Cup Broadcasts on English-language Channels in the United States*

Match	**Tournament Round**	**Total non-match time observed (Hour:minutes:seconds)**
Germany v. Argentina	Final	1:55:59
Brazil v. Netherlands	Play-off for third place	0:53:06
Netherlands v. Argentina	Semi-final	1:31:12
Brazil v. Germany	Semi-final	1:33:06
Netherlands v. Costa Rica	Quarter-final	1:29:50
Argentina v. Belgium	Quarter-final	0:58:44
France v. Germany	Quarter-final	0:57:40
Belgium v. USA	Round of 16	1:22:30
Germany v. Algeria	Round of 16	0:53:41
France v. Nigeria	Round of 16	0:24:20
Total		12:00:08

Table 2: *Frequency, n (%), of Food, Non-alcoholic Beverage, Alcohol, and Other Commercial Advertisements (Ads) that aired during the 2014 FIFA World Cup Tournament Broadcasts*

	Unweighted Sample of Ads	**Weighted Sample of Ads**
Food	9 (4.8)	39 (7.3)
Non-alcoholic Beverage	10 (5.3)	47 (8.9)
Alcohol	10 (5.3)	37 (7.0)
Other	159 (84.6)	408 (76.8)
Total	188 (100.0)	531 (100.0)

Two graduate students at UCONN Health's Department of Community Medicine and Health Care rated all ads in the unweighted sample after discussing the codebook and applying it in two rounds to gain a consensus. After the second round, they reconciled any remaining coding discrepancies through discussion. A pooled kappa was calculated for nominal ratings such as the presence of child-targeted marketing (CTM) themes or Guiding Principles' violations (GPV). The pooled kappa for CTM was 0.8240 and GPV (at the sub-guideline level) was 0.6512 (De Vries, Elliott, Kanouse, & Teleki, 2008). According to De Vries et al. (2008), this calculation is a better estimate than the more commonly used kappa statistic to estimate interrater reliability between coders when there are many ratings per unit of observation (i.e. each unique ad) compared to the number of measurements per unit, especially when the measures fall within the same domain (i.e. 9 CTM items, and 37 GPV items for an n of 29). The NPI score was calculated by only one of the coders, therefore no interrater reliability was calculated for these scores.

Table 3 provides the frequency of Child-Targeted Marketing Themes (CTM) and Table 4 provides the frequency of observed sub-guideline Guiding Principle violations (GPV). The frequencies of CTM themes and GP sub-guideline violations were calculated

for both the unweighted sample (n=29) and for the weighted sample (n=123). The latter accounts for broadcast frequency and provides a better estimate of content exposure for the audience. The two most frequent CTM themes present in the sample of ads were child-appealing themes, which included fun, excitement, and winning the big game, and child-appealing locations or features of a location, such as a playground. Given that the ads were aired during a large sporting event, it was expected that sport themes would be highly prevalent. The two most frequent Guiding Principle sub-guidelines to be violated in the sample of ads were "the ad presents the product as necessary for social success" and "the ad suggests that the product can enhance physical, sporting, or mental ability." The mean CTM score was 1.45 (1.183) for the unweighted sample (n=29) and 1.64 (0.344) for weighted sample (n=123). The mean GPV score was 4.62 (2.211) and 5.16 (2.155) for the unweighted and weighted samples, respectively. For both content measures the weighted mean was greater than the unweighted mean, indicating that ads inappropriate for young audiences were broadcasted more than those that were appropriate.

Table 3: *Prevalence, n (%) of the Nine Qualitative Characteristics of Child Targeted Marketing (CTM) and Mean CTM Score for Food ($n_{unweighted}$=9, $n_{weighted}$=39), Non-alcoholic Beverages ($n_{unweighted}$=10, $n_{weighted}$=47), and Alcohol ($n_{unweighted}$=10, $n_{weighted}$=37)*

Qualitative Characteristic		Food	Non-alcoholic Beverages	Alcohol	Total
	$N_{unweighted}$	9	10	10	29
	$N_{weighted}$	39	47	37	123
Anthropomorphic objects and animals	U	0 (0.0)	1 (10.0)	0 (0.0)	1 (3.4)
	W	0 (0.0)	6 (12.8)	0	6 (4.9)
Licensed characters or brand Mascots	U	0 (0.0)	1 (10.0)	0 (0.0)	1 (3.4)
	W	0 (0.0)	6 (12.8)	0	6 (4.9)
Interactive content and apps	U	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	W	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Famous people and characters	U	1 (11.1)	4 (40.0)	0 (0.0)	5 (17.2)
	W	3 (7.7)	27 (57.4)	0 (0.0)	30 (24.4)
Directly address children	U	0 (0.0)	1 (10.0)	0 (0.0)	1 (3.4)
	W	0 (0.0)	1 (2.1)	0 (0.0)	1 (0.8)
Child-appealing themes	U	1 (11.1)	8 (80.0)	4 (40.0)	13 (44.8)
	W	11 (28.2)	35 (74.5)	6 (16.2)	52 (42.3)
Child-appealing packaging or product design	U	2 (22.2)	0 (0.0)	0 (0.0)	2 (6.9)
	W	6 (15.4)	0 (0.0)	0 (0.0)	6 (4.9)
Child-oriented sounds and images	U	4 (44.4)	4 (40.0)	1 (10.0)	9 (31.0)
	W	11 (28.2)	32 (68.1)	1 (2.7)	44 (35.8)
Child-appealing locations and features	U	2 (22.2)	5 (50.0)	3 (30.0)	10 (34.5)
	W	19 (48.7)	26 (55.3)	12 (32.4)	57 (46.3)
Mean CTM Score (SD)	U	1.11 (0.782)	2.40 (1.075)	0.80 (1.032)	1.45 (1.183)
	W	1.28 (0.724)	2.83 (1.185)	0.51 (0.692)	1.64 (0.344)
Ads with any CTM (%)	U	7 (77.8)	10 (100.0)	5 (50.0)	22 (75.9)
	W	33 (84.6)	47 (100.0)	16 (43.2)	96 (78.0)

Table 4: *Prevalence, n (%), of Generic Guiding Principles' Guideline (G) and Sub-guideline (SG) Violations and Mean violations per ad for Food ($n_{unweighted}$=9, $n_{weighted}$=39), Non-alcoholic Beverages ($n_{unweighted}$=10, $n_{weighted}$=47), and Alcohol ($n_{unweighted}$=10, $n_{weighted}$=37)*

Guideline (G) / Sub-guideline (SG)			Food	Non-alcoholic Beverage	Alcohol	Total
		$N_{unweighted}$	9	10	10	29
		$N_{weighted}$	39	47	37	123
G 1	*Responsible Marketing Communications*	U	1 (11.1)	3 (30.0)	2 (20.0)	6 (20.7)
		W	3 (7.7)	21 (44.7)	16 (43.2)	40 (32.5)
SG 1.1	Be legal, decent, honest and truthful, and conform to accepted principles of fair competition and good business practice.	U	0 (0.0)	1 (10.0)	0 (0.0)	1 (3.4)
		W	0 (0.0)	14 (29.8)	0 (0.0)	14 (11.4)
SG 1.2	Be prepared with a due sense of social responsibility, not using themes, images, symbols, or portrayals likely to be considered offensive, derogatory, or demeaning.	U	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
		W	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
SG 1.4	Respect human dignity and integrity.	U	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
		W	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
SG 1.5	Avoid any association with violent, aggressive, hazardous, illegal, or antisocial behavior.	U	1 (11.1)	2 (20.0)	2 (20.0)	5 (17.2)
		W	3 (7.7)	7 (14.9)	16 (43.2)	26 (21.1)
G 2	*Responsible Consumption*	U	0 (0.00)	2 (20.0)	2 (20.0)	4 (13.8)
		W	0 (0.00)	8 (17.0)	11 (29.7)	19 (15.4)
SG 2.1	Portray only moderate and responsible consumption.	U	0 (0.00)	10 (10.0)	10 (10.0)	2 (6.6)
		W	0 (0.00)	3 (6.4)	10 (27.0)	13 (10.6)
SG 2.2	Avoid condoning or trivializing excessive or irresponsible consumption or intoxication.	U	0 (0.0)	2 (20.0)	1 (10.0)	3 (10.3)
		W	0 (0.0)	8 (17.0)	1 (2.7)	9 (7.3)
G 3	*Health and Safety Aspects in Marketing Communications*	U	5 (55.6)	8 (80.0)	10 (100.0)	23 (79.3)
		W	31 (79.5)	40 (85.1)	37 (100.0)	108 (87.8)
SG 3.1	Suggest that the product can prevent, treat, or cure illness or resolve personal problems.	U	3 (33.3)	6 (60.0)	0 (0.0)	9 (31.0)
		W	12 (30.8)	29 (61.7)	0 (0.0)	41 (33.3)
SG 3.2	Presents the product as a stimulant, sedative, or tranquilizer.	U	5 (55.6)	5 (50.0)	7 (70.0)	17 (58.6)
		W	31 (79.5)	32 (68.1)	30 (81.1)	43 (75.6)

SG 3.3	Depicts or addressed to at-risk groups, e.g., pregnant women.	U	3 (33.3)	7 (70.0)	8 (80.0)	18 (62.1)
		W	23 (59.0)	37 (78.7)	22 (59.5)	82 (66.7)
G 4	*Minors*	U	0 (0.0)	4 (40.0)	4 (40.0)	8 (27.6)
		W	0 (0.0)	24 (51.1)	14 (37.8)	38 (30.9)
SG 4.1	Avoid the use of themes, icons, music, games, or characters that appeal primarily to individuals under the age stated in each industries' marketing pledges.	U	0 (0.0)	4 (40.0)	3 (30.0)	7 (24.1)
		W	0 (0.0)	24 (51.1)	12 (32.4)	36 (29.3)
SG 4.2	Avoid showing individuals under the age stated in each industries' marketing pledges	U	0 (0.0)	0 (0.0)	4 (40.0)	4 (13.8)
		W	0 (0.0)	0 (0.0)	14 (37.8)	14 (11.4)
G 5	*The Effects of the Product*	U	9 (100.0)	8 (80.0)	10 (100.0)	26 (89.7)
		W	39 (100.0)	35 (74.5)	35 (94.6)	109 (88.6)
SG 5.3	Suggests that the products can enhance physical, sporting, or mental ability.	U	8 (88.9)	8 (80.0)	9 (90.0)	25 (86.2)
		W	35 (89.7)	35 (74.5)	35 (94.6)	105 (85.4)
SG 5.4	Presents the product as necessary for social success or acceptance.	U	9 (100.0)	8 (80.0)	9 (90.0)	26 (89.7)
		W	39 (100.0)	35 (74.5)	35 (94.6)	109 (88.6)
SG 5.5	Presents the product as a means of removing social or sexual inhibitions, achieving sexual success, or making an individual more sexually attractive.	U	5 (55.6)	5 (50.0)	7 (70.0)	17 (58.6)
		W	31 (79.5)	32 (68.1)	30 (81.1)	93 (75.6)
Mean Sub-guideline Violations per Ad		U	3.78 (1.563)	4.90 (2.514)	5.10 (2.278)	4.62 (2.211)
		W	4.46 (1.189)	5.45 (2.685)	5.54 (2.063)	5.16 (2.155)
Ads with any Sub-guideline Violation		U	9 (100.0)	10 (100.0)	10 (100.0)	29 (100.0)
		W	39 (100.0)	47 (100.0)	37 (100.0)	123 (100.0)

Table 5 provides the descriptive statistics for the Nutrient Profiling Index (NPI) score for food and non-alcoholic beverage ads. While NPI scores were originally calculated for alcohol products advertised, the scale was not validated for such products; however, advertising any alcohol product to a large audience is "unhealthy". Therefore, the alcohol ads were excluded from the analyses involving the NPI. In terms of this objective nutritional quality score, 59.3% of the 86 food and non-alcohol beverage ads promoted products that were considered less healthy. Since no alcohol should be advertised, 71.5% of the 123 ads should not have been advertised to a large audience of children and adolescents.

Table 5: *Mean Nutrient Profiling Index (NPI) Score and Frequency, n (%), of ads below recommended limit Food ($n_{unweighted}$=9, $n_{weighted}$=39) and Non-alcoholic Beverages ($n_{unweighted}$=10, $n_{weighted}$=47)*

		Food	Non-alcoholic Beverages	Total
	$N_{unweighted}$	9	10	19
	$N_{weighted}$	39	47	86
Mean (SD)	U	62.00 (13.748)	67.80 (1.751)	65.05 (9.715)
	T	57.69 (17.269)	67.91 (1.316)	63.28 (12.667)
Ads below UK Ofcom's standard*, n (%)	U	2 (22.2)	7 (70.0)	9 (47.4)
	T	13 (33.3)	38 (89.9)	51 (59.3)

*Food that score below 64 and drinks that score below 70 are considered less healthy by the NPI and are not permitted to be advertised when the television audience has a large proportion of children and adolescents in the United Kingdom.

The weighted sample of food and non-alcoholic beverage ads was dichotomized into healthy and less healthy groups and independent t-tests were performed for scores of Child Targeted Marketing (CTM) and Guiding Principles violations (GPV). The mean CTM score was significantly higher for less healthy food and non-alcoholic beverage ads

compared to healthy ads (two-samples t(84)=6.756, p<0.001), but the mean GPV score was not (two-samples t(84)=1.208, p=0.230). Next, the sample was split by product type and one-way ANOVAs indicated the NPI, CTM, GPV mean scores were significantly different between alcohol, food, and non-alcoholic beverage ads. On average, food ads scored the least on the NPI, non-alcoholic beverages had the most CTM, and alcohol had the most GPV. See Table 6 for means and F-values by product group.

Table 6: Weighted Score Means (M) and Standard Deviations (SD) for Measures of Child-Targeted Marketing (CTM), Guiding Principles for Responsible Marketing Violations (GPV), and Nutrient Profiling Index (NPI) for Food (n=39), Non-alcoholic Beverage (n=49), and Alcohol (n=37) Ads

Measure	**Food**	**Non-alcoholic Beverage**	**Alcohol**[+]	**F**
	M (SD)	*M (SD)*	*M (SD)*	
CTM Score	1.28 (0.72)	2.83 (1.19)	0.51 (0.69)	69.85**
GPV Score	4.46 (1.19)	5.45 (2.69)	5.54 (2.06)	3.15*
NPI Score	57.69 (17.27)	67.91 (1.32)	---	16.40**

*p<0.05, **p<0.001

[+] The Nutrient Profiling Index was not created or validated to assess alcohol products, and were excluded from analyses of NPI scores.

Finally, Table 7 provides Pearson's r correlations, which were calculated to examine associations between the various measures. For food ads, CTM and NPI were significantly correlated, indicating that less healthy ads were associated with greater CTM. NPI scores were not significantly associated with either CTM or GPV for the non-alcoholic beverage ads. CTM scores were significantly correlated with GPV scores for the alcohol ads. The two coders rated additional items for each unique ad such as the perceived age of the youngest person and the level of physical activity for the least and most active

characters featured in the ad. This data was determined to be superfluous for this content analysis but a table with its descriptive statistics can be found in Appendix A.

Table 7: Pearson's Correlation between Weighted Scores of CTM, GPV, and NPI for Food (n=39), Non-alcoholic Beverage (n=49), and Alcohol (n=37) Ads

	Food			Non-alcoholic Beverage			Alcohol[+]	
	CTM	*GPV*	*NPI*	*CTM*	*GPV*	*NPI*	*CTM*	*GPV*
CTM		0.3	-0.55**		0.30*	0.10		0.42**
GPV	0.3		-0.08	0.30*		0.13	0.42**	
NPI	-0.55**	-0.08		0.10	0.13			

*p<0.05, **p<0.001

[+] The Nutrient Profiling Index was not created or validated to assess alcohol products, and were excluded from analyses of NPI scores.

DISCUSSION

This study examined advertising of three potentially unhealthy commodities: food, non-alcoholic beverages, and alcohol. It focused on overall exposure and messages that vulnerable audiences, particularly children and adolescents, may have been exposed to during broadcasts of a large international sporting event where marketing is restricted by industry-created self-regulated codes of conduct. Soccer appears to be gaining popularity among Americans and increasing audiences in the U.S. are anticipated. It is likely that a large number of children, adolescents, and teens, who are under the legal purchasing age for alcohol, were among the US audience, and were simultaneously exposed to products that cause NCDs and thematic content that is both incongruent with the true effects of product consumption, and especially appealing to younger viewers. In a report commissioned by FIFA on the 2014 World Cup television audience, Kantar Media (2015) reports the broadcast of the match between USA and Portugal broke national records in the U.S. with an audience of 18.2 million individuals watching nationwide. Overall, an estimated 105.3 million Americans watched at least 20 consecutive minutes of any broadcast, which is a 61% increase from the previous World Cup in 2010 (Kantar Media, 2015).

Given that the overall prevalence of food, non-alcoholic beverage, and alcohol advertisements was 23.2%, the next research question addressed in this study was whether those ads were appropriate for large a number of children and adolescents. Using the NPI, it was determined that on average, both food and non-alcoholic beverage ads featured products or brands that were below nutritional standards for child-audiences. Furthermore,

the unhealthy ads were broadcasted more frequently than those with higher NPI scores. When combined with all alcohol ads since alcohol is prohibited for individuals under twenty-one years of age and a recent meta-analysis concluded no level of alcohol consumption is beneficial to a person's relative risk of all-cause mortality (Stockwell, Zhao, Panwar, Roemer, Naimi, & Chikritzhs, 2016), 71.5% of the food and beverage ads were unhealthy, which is 16.6% of all ads observed in the ten broadcasts that were likely to have the highest audiences.

Another important finding in the present study is that the ads marketing less healthy products had significantly greater scores for Child Targeted Marketing (CTM) than healthy products. Of the food ads, Pringles' ad was most frequent (n=11) and showed adolescents running around playing soccer and playing the drums with canister the chips are packaged in. The most frequent advertised beverage was for the sports drink Gatorade (n=14), which showed several famous soccer plays training and then ultimately heading out onto the pitch of the World Cup while the song from Disney's classic children's movie *Cinderella*, "Bibbidi-Bobbidi-Boo" played in the background. Gatorade logos were continuously displayed across the different scenes. According to NPI and the UK Ofcom's thresholds, both of these ads are for "less healthy" products. Not only was there a high proportion of unhealthy products advertised during the World Cup, the ads violated industry marketing codes. Similar findings have been observed. For example, Kelly, Halford, Boyland, Chapman, Bausista-Castaño, Berg,…and Summberbell (2010) examined nutritional quality of food, non-alcoholic beverage, and alcohol ads from weekday and weekend broadcasts in thirteen countries. Categorizing all the products covered in this sample, they classified

products as core foods, noncore foods, which is synonymous with unhealthy and included alcohol, fast food, and sugar-sweetened beverages. Noncore foods made up 71% of all the food ads during sports broadcasting (Kelly et al., 2010). During a three-game series of rugby in Australia, less than 1% of the ads promoted alcohol but 33% of the ads promoted unhealthy food and beverages during the broadcasts (Lindsay et al., 2013).

The relative number of unhealthy products advertised and the violations to marketing pledges do not fully account for problematic nature of the observed ads. The content of the ads connects product consumption with outcomes that are the opposite of their actual consequences, increasing the risk of NCDs. In this study, the most prevalent *Child-Targeted Marketing Characteristics* were "child-appealing themes" and "child-appealing locations and features." This is due to the overall sports theme or references throughout many of the ads. The most prevalent Guiding Principles' violations were that the ad "suggests the product can enhance physical, sporting, or mental ability" and the ad "presents the product as necessary for social success." These two sub-guidelines fall under the guideline for effects of the product. This has been observed across multiple countries during the 2014 FIFA World Cup for alcohol ads of a larger sample by Noel et al. (2017). Both Powerade and Gatorade showed characters training and then competing in soccer and other sports, suggesting that the products are essential to keeping the athletes ready to play. The slogan in the Pringles ad was "You don't just eat 'em, you get match ready with 'em" which is proclaimed after a group of adolescent and teenage boys open a can of the chips and run around their city fooling around and bonding. The Corona Extra ad shows two

young men carrying a cooler filled with the beer from one party to another, and as soon as the cooler is viewed by other party-goers the men become the center of attention.

However, the most frequent CTM characteristics and GPVs were more thematic and not glaringly blatant. It is important to note that the guideline with the least GPV was responsible marketing communications, indicating that at least the ads were respectful and that no false information was explicitly provided. Additionally, for the CTM measure, none or very few ads directly addressed children, contained licensed characters or mascots, or promoted interactive content.

For within product-type correlations, CTM and GPV scores positively correlated at a statistically significant level for non-alcoholic beverages and alcohol but not for food. This indicates the use of measures developed for food and beverages and for alcohol can be used to assess the other types of product; however, both measures may lack important marketing features, given the correlation is not perfect. Interestingly, the NPI was not significantly correlated with either CTM or GPV for the non-alcoholic beverages. This may be due the small sample size and the low variance across all the measures for this category.

LIMITATIONS

This study had several limitations. First, we used purposive sampling to collect a sample of commercials aired during the 2014 FIFA World Cup broadcasts. The purposive sample was selected to maximize the variety of products to which the greatest number of people were exposed. Thus, it is possible this study's sample over-represents advertising of unhealthy products since more group matches aired in the morning—a time when child audiences are higher and the food and beverage industries have pledged to market healthier products. But this is unlikely because the matches were still aired on sports channels, which never have a large enough proportion of children and adolescents in its audience to be restricted as they are for child-specific programming and channels exclusively for children. Indeed, the tournament matches were likely to have the most children and adolescents watching even if they made up less than 30% of the entire audience, which is the percent a youth audience must comprise to be categorized as child-targeted (WHO, 2010). This study would be strengthened by better estimates of the audience across age groups.

A second potential sampling limitation is that three of the broadcast recordings were incomplete. While this could bias the results of the sample, it is unlikely given that the missing segments were not systematic but due to a failure of recording equipment.

Another important limitation to all studies using content analyses is the threat to validity. In a study that uses both latent manifest content (i.e. product type and brand) as well as manifest content (i.e. healthfulness, nutrient content, and qualitative characteristics), the primary concern is face validity, which in turn reduces the entire

study's validity. Validity is not without costs; improving validity will reduce the study's reliability.

With this concern in mind, the measures were adapted from previously validated ones. For instance, the GPV was shortened and two coders rated the ads in two rounds and then resolved discrepancies where previous studies using the same items used the Delphi Method (Babor et al., 2013; Noel et al., 2017). However, the pooled kappa was 0.6512, which is considered "moderate agreement" and is therefore acceptable. The CTM measure was created from the Heathy Eating Research's (2016) positon paper on child-targeted marketing. Also, the pooled kappa for CTM was higher and at a more acceptable level (0.8240). The NPI scoring used all available data from the producers when available and has been validated so estimates should be accurate and not have systematic error.

Last, the frequency of commercials for unhealthy products is not a surrogate for overall product exposure, because soccer broadcasts include other product cues such as logos that are visible on the onscreen scoreboard, the wall-like borders of the pitch or field, and on the boards used as backgrounds for interviews. Furthermore, camera sweeps of the live audience show many people holding cups with logos. These exposures are frequent and important (Adams et al., 2014; Graham & Adams, 2014; Lindsay et al., 2013; Noel et al., 2017), but measurement of these other marketing techniques was beyond the resources of this study.

CONCLUSION

Given the high frequency of child-targeted marketing techniques and *Guiding Principles'* violations observed along with the high proportion of unhealthy products and brands being marketed, this study provides additional evidence that industry created and self-regulated marketing is ineffective at protecting children and adolescents from unhealthy commodities. Ongoing upstream public health surveillance and policy changes, such as more stringent marketing restrictions, may be required to combat NCDs, and ultimately, protect children and other vulnerable populations through primary and secondary prevention. Furthermore, public health surveillance of marketing requires the development or adaptation of validated measures to compare marketing practices across product types to accurately examine the effects of exposure to "unhealthy commodities" on noncommunicable diseases.

APPENDIX A

Descriptive Statistics of Additional Content Variables for Food ($n_{unweighted}$=9, $n_{weighted}$=39), Non-alcoholic Beverages ($n_{unweighted}$=10, $n_{weighted}$=47), and Alcohol ($n_{unweighted}$=10, $n_{weighted}$=37) Advertisements

		Food	Non-alcoholic Beverages	Alcohol	Total
$N_{unweighted}$		9	10	10	29
$N_{weighted}$		39	47	37	123
Age of Youngest, *Mean (SE)*	U	29.44 (17.791)	33.30 (9.753)	27.30 (10.056)	26.24 (12.758)
	W	32.59 (22.073)	23.43 (8.782)	30.51 (10.655)	28.46 (15.193)
Amount Consumed by Youngest, *Frequencies (%)*					
Under Dietary Guidelines	U	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	W	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Within Dietary Guidelines	U	6 (66.7)	7 (70.0)	3 (30.0)	16 (55.2)
	W	34 (87.2)	36 (76.6)	17 (45.9)	87 (70.7)
Above Dietary Guidelines	U	0 (0.0)	1 (10.0)	4 (40.0)	5 (17.2)
	W	0 (0.0)	3 (6.4)	13 (35.1)	16 (13.0)
Not Applicable	U	3 (33.3)	2 (20.0)	3 (30.0)	8 (27.6)
	W	5 (12.8)	8 (87.0)	7 (18.9)	20 (16.3)
Weight of Smallest, *Frequencies (%)*					
Underweight	U	0 (0.0)	1 (10.0)	0 (0.0)	1 (3.4)
	W	0 (0.0)	3 (6.4)	0 (0.0)	3 (2.4)
Normal	U	9 (100.0)	8 (80.0)	10 (100.0)	27 (93.1)
	W	39 (100.0)	38 (86.9)	37 (100.0)	114 (92.7)
Overweight	U	0 (0.0)	1 (10.0)	0 (0.0)	1 (3.4)
	W	0 (0.0)	6 (12.8)	0 (0.0)	6 (4.9)
Obese	U	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	W	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Not applicable	U	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	W	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Weight of Largest, *Frequencies (%)*					
Underweight	U	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	W	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

		Food	Non-alcoholic Beverages	Alcohol	Total
	$N_{unweighted}$	9	10	10	29
	$N_{weighted}$	39	47	37	123
Normal	U	6 (66.7)	8 (80.0)	8 (80.0)	22 (75.9)
	W	31 (79.5)	40 (85.1)	33 (89.2)	104 (84.6)
Overweight	U	3 (33.3)	2 (20.0)	1 (10.0)	6 (20.7)
	W	8 (10.5)	7 (14.9)	3 (8.1)	18 (14.6)
Obese	U	0 (0.0)	0 (0.0)	1 (10.0)	1 (3.4)
	W	0 (0.0)	0 (0.0)	1 (2.7)	1 (0.8)
Not applicable	U	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	W	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Activity Level of Most Active, *Frequencies (%)*					
Sedentary	U	3 (33.3)	0 (0.0)	0 (0.0)	3 (10.3)
	W	6 (15.4)	0 (0.0)	0 (0.0)	6 (4.9)
Light	U	4 (44.4)	2 (20.0)	3 (30.0)	9 (31.0)
	W	14 (35.9)	11 (23.4)	5 (13.5)	30 (24.4)
Moderate	U	0 (0.0)	3 (30.0)	4 (40.0)	7 (24.1)
	W	0 (0.0)	10 (21.3)	14 (37.8)	24 (19.5)
Vigorous	U	2 (22.2)	5 (50.0)	3 (30.0)	10 (34.5)
	W	19 (48.7)	26 (55.3)	18 (48.6)	63 (51.2)
Not applicable	U	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	W	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Activity Level of Least Active, *Frequencies (%)*					
Sedentary	U	8 (88.9)	7 (70.0)	7 (70.0)	22 (75.9)
	W	35 (89.7)	20 (42.6)	20 (54.1)	75 (61.0)
Light	U	1 (11.1)	1 (10.0)	2 (20.0)	4 (13.8)
	W	4 (10.3)	14 (29. 8)	16 (43.2)	34 (27.6)
Moderate	U	0 (0.0)	2 (20.0)	1 (10.0)	3 (10.3)
	W	0 (0.0)	13 (27.7)	1 (2.7)	14 (11.4)
Vigorous	U	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	W	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Not applicable	U	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	W	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

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