University of Nevada, Reno

Consumers' Opinions of Recipes for Healthful Beverages Distributed at SNAP Authorized Grocery Stores

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Nutrition

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December, 2019

THE GRADUATE SCHOOL

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Entitled

Consumers' Opinions Of Recipes For Healthful Beverages Distributed At SNAP-Authorized Grocery Stores

be accepted in partial fulfillment of the requirements for
the degree of

MASTER OF SCIENCE

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December, 2019

Abstract

The overall purpose of this study was to examine consumers' use and perceptions of healthful beverage recipe cards distributed at 18 grocery stores located throughout northern Nevada. The grocery stores were those who had agreed to be a part of the *Rethink Your Drink Nevada* (RYD) program and consequently, provided store space for a display stand featuring a variety of free recipe cards for healthful, low-cost beverages. To address the research objectives, a descriptive cross-sectional online survey was conducted. Displays were stocked with free recipe cards inviting consumers to prepare one of the recipes and complete an online survey administered using Survio during the four-month study period. Respondents received a $10 e-gift card. At the close of the study, approximately 21,000 recipe cards were distributed, and 252 surveys were completed. Survey results showed that half of the respondents were female (51%); nearly all had at least a high school education or more (90%); and a majority lived in a household with children (53%). Only a small percentage participated in the Supplemental Nutrition Assistance Program (SNAP; 15%) or the Supplemental Nutrition Assistance Program for Women, Infants and Children (WIC; 11%). The reasons most often endorsed for taking a card were interest in a new recipe (47%), the cards were free (46%) and/or the desire to make healthy drinks (44%). A majority strongly agreed/agreed that the instructions were simple (95%), the ingredients were items they already buy (72%), and the recipes made healthy drinks more convenient (79%). Few found the ingredients too costly (10%) or noted that important information was missing

(13%). Respondents also reported a number of ways the cards were of personal benefit. A large proportion had prepared one or more of the recipes (90%) and were satisfied with the results. Of those who had not, 60% indicated they planned to do so in the next few weeks. In conclusion, consumers' opinions and use of free recipe cards for healthful beverages provide further evidence that point-of-purchase interventions have great potential. Further research is needed to determine the extent to which this approach improves food and beverage choices and reduces the intake of sugar-sweetened beverages.

Acknowledgements

First, I would like to thank my advisor, Dr. Jamie Benedict, for her many hours of endless guidance, support, and persevering patience during my graduate school work. I feel so fortunate and grateful to have had the opportunity to work and learn under her direction and leadership. I would also like to thank my committee members, Dr. Stanley Omaye and Dr. John Packham, for their kindness, support and valuable input during my graduate work. Special thanks to Dr. Elizabeth Christiansen for assisting with the statistical analysis.

I also want to thank my supportive friends, Megan Wahrenburg, Deborah Jones, Erin Engle, Hailey Fox, Kat Lambrecht, and especially Kelly Eiler, for her generosity in bringing food to lab in the days and long hours before finishing my thesis. To my husband of 37 years, Ray, thank you for your unending love, support, and patience throughout this process and always encouraging me to believe in myself.

I would also like to thank the grocery stores in northern Nevada who partner with *Rethink Your Drink Nevada*, and all the respondents who participated in my research study. This study was funded by the USDA's Supplemental Nutrition Assistance Program- SNAP.

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Chapter 1

Introduction to Thesis

This thesis study will begin with an introduction and overview of the study. In Chapter 2, the existing literature pertaining to the research topic is discussed. A manuscript describing the results of the study for submission to the *Journal of Nutrition Education and Behavior* is presented in Chapter 3. Lastly, conclusions and implications of this study are described in Chapter 4.

Statement of the Problem

The 2025-2020 Dietary Guidelines for Americans recommend that added sugars contribute less than 10% of total calories consumed, yet estimates indicate that US children are consuming 17% of their calories from added sugars, nearly half of which are from sugar-sweetened beverages (SSB).[1,2] Excessive consumption of added sugars, including those from SSB, is associated with childhood obesity,[3-5] especially among those who are socioeconomically vulnerable.[6,7] Childhood obesity increases the risk of obesity in adulthood and can lead to negative health outcomes and related health care costs.[8] Obesity also increases the risk for type 2 diabetes, dyslipidemia, cardiovascular disease, and non-alcoholic fatty liver disease.[9-14] Thus, efforts are needed to reduce SSB consumption and subsequently help to prevent the development of obesity among children.[3,15]

SSB are generally defined as beverages that contain caloric sweeteners, such as soda, fruit drinks (including sweetened bottled waters and fruit juices and nectars with added sugars), sports and energy drinks, sweetened coffee and

teas.[12,16] While SSB consumption varies considerably by geographic location, gender, age, and socioeconomic status; SSB are usually consumed in the home,[17]and grocery stores are the most common purchase location.[18]

There is evidence that point-of-purchase interventions in the grocery store setting can be an effective method to modify consumer food purchases.[19,20] Questions remain regarding the use of this strategy to curb SSB purchases.

Context

This thesis study represents one component of larger effort promote healthful beverages choices and reduce SSB intake among children residing in low-income households. *Rethink Your Drink Nevada* (RYD) is led by Dr. Jamie Benedict of the Department of Nutrition at the University of Nevada, Reno. The primary target audience is households enrolled in SNAP, specifically parents/guardians of young school age children, 6-12 years old in northern Nevada. A secondary audience includes medical and dental care professionals who are likely to treat children from low-income households. RYD interventions reflect the social ecological model as well as social marketing approaches.

The RYD program components include those targeting individual knowledge and skills; home school and grocery store settings; medical and dental care practices; and print and digital media.[21-28] The program attempts to enhance parent/guardians' knowledge and skill related to healthful beverage selection for children in their household through a direct mail campaign to eligible SNAP households; through outdoor advertising and newspaper ads; and via social media

platforms including FaceBook and Pinterest; and finally through advice/education provided by medical and dental care professionals. To facilitate the latter, RYD Toolkits are distributed for free to all eligible practices in 16 of Nevada's 17 counties.

More recently, partnerships with SNAP-authorized grocery retail stores were initiated after conducting a feasibility study in 2016. The RYD point-of purchase intervention is the product of that effort. At the close of 2017, a RYD recipe card display was located in one grocery store in one county. At the time of this study, the number of stores had grown to 18 in six counties. Currently, there are 23 grocery stores in eight counties who partner with RYD for the purpose of promoting healthful beverage choices. The recipe card displays are free-standing, clear acrylic stands with a poster display (double-sided viewing) and a clear pocket holder attachment with slots for approximately 200 copies of four different recipes. The stands are most often placed in the produce section, but have been relocated to other store areas, on occasion, per the store managers' preference.

The recipes themselves, developed by the RYD team, are simple to prepare, require no special kitchen equipment, and include low-cost ingredients. Most recipes include a variety of fruits, vegetables, herbs and/or spices to flavor tap or sparkling water; a smaller number are milk-based. Several are marked "For little cooks" and can be safely prepared by young children (e.g., involve no cutting). The recipes are printed full-color on 5x7" glossy card stock with English text on one side and Spanish text on the reverse. Suggestions for minimizing food waste are offered

as appropriate on select cards. The posters and recipe cards in the displays were changed approximately each month to represent seasonality and maintain consumer interest.

Purpose and Methods

The overall purpose of this study was to examine consumers' use and perceptions healthful beverage recipe cards distributed at participating grocery stores as one component of the RYD program. The objectives of this study were as follows:

1) To describe the sociodemographic characteristics of consumers who picked-up the recipe cards from the RYD displays;

2) To describe consumers' perceptions of the grocery store where the RYD recipe cards for healthful beverages were distributed;

3) To determine factors that motivated consumers to take the recipe card(s), their opinions of specific features of the cards, and the extent to which they found the recipe cards to be of benefit; and

4) To assess what behaviors, if any, were modified as a result of recipe cards.

The results of this study will ideally add to the body of knowledge regarding the use of recipes to promote healthful beverages in a grocery store setting.

A cross-sectional survey was conducted among a convenience sample of consumers at 18 RYD participating grocery stores located in or near low-income communities in Northern Nevada. The survey was conducted from September 2018 to January 2019 at which time RYD recipe displays stands located in these stores

were stocked with both posters and recipe cards inviting consumers to try one of the RYD recipes and complete an online survey. The survey was conducted online using Survio.

Summary

In this chapter, the research problem was explained and the context was described. This was followed by the study purpose and objectives. Research methods were briefly noted.

Chapter 2

Review of the Literature

As a basis for this thesis study, research related to consumption trends and patterns of sugar-sweetened beverages (SSB) and the epidemic of childhood obesity and health disparities are discussed. Next, analysis of the association between SSB consumption and negative health outcomes is described. In addition, recommendations and interventions to effectively reduce SSB consumption are explained. Finally, the use of food environment and grocery store interventions to promote healthful beverages are discussed.

The Center for Disease Control and Prevention (CDC) defines SSB as regular soda, fruit drinks (included sweetened bottled waters and fruit juices and nectars with added sugars), sports and energy drinks, sweetened coffee and teas.[15,29] According to this definition, SSB do not include diet drinks (defined as less than 40 kcal/240 mL of the beverage), 100% fruit juice, or drinks sweetened by the drinker such as coffee and teas, alcohol, or flavored milks with added sugar.[12,16] CDC's definition of SSB is widely adopted, yet not all studies use this definition.[15] This is an important characteristic of the related literature.

Patterns of Sugar-Sweetened Beverage Intake among U.S. Children

Data from the National Health and Nutrition Survey (NHANES), are useful for describing SSB consumption trends. For example, results reported by Momin et al, indicate that children's SSB consumption increased between the late 1970's and 1980's to the late 1990s, with a small increase in the number of heavy SSB drinkers

(defined as consuming greater than 500 kcal/day from SSB) partly responsible for that increase.[15] Since the late 1990s, SSB intake among children has declined; energy intake from SSB declined approximately 30% between 1999 and 2010 from 223 to 155 kcal/day and decreased 7.7% between 2010 and 2014.[15] Overall, from 2003 to 2014, the percentage of children in the U.S consuming at least one SSB on a typical day declined significantly from 80% to 61%.[30,31] Despite these important declines, it is estimated that almost two-thirds of US children and adolescents consume at least one SSB on a given day (46.5% aged 2-5, 63% aged 6-11 and 65.4% aged 12-19).[13,30]

SSB contributed 4.1 % of total daily calories consumed for boys aged 2-5 yrs, 6.6% for boys 6-11 yrs, and 9.3% for boys 12-19 yrs.[13] SSB contributed 4.0% of total daily calories consumed for girls aged 2-5 yrs, 5.8% for girls 6-11 yrs, and 9.7% for girls 12-19 yrs.[13] Overall, boys consumed on average 164 kilocalories (kcal) from SSB which amounted to 7.3% of total daily caloric intake. Girls consumed an average 121 kcal from SSB, which amounted to 7.2% of total daily caloric intake.[13] Further, 32.7 % of boys consumed one SSB, 20.2% consumed two SSB, and 11.5% consumed three or more on a given day.[13] Among girls, 33.7% consumed one SSB, 18.1% consumed two SSB, and 9.5% consumed three or more on a given day. Youth aged 2-19 consumed an average 143 kcal from SSB, that contributed 7.3% of their daily calories on a given day during 2011-2014.[13] Among both boys and girls, older youth had the highest mean intake and percentage of daily calories from SSB relative to younger children.[13] In addition, more recent studies show that SSB consumption increased with age for both males and females,[13] and SSB consumption begins as

young as infancy, where it is associated with a higher likelihood of consuming SSB later in childhood.[32]

Differences in child SSB consumption among low-income and racial and ethnic minorities persist. [33]A cross-sectional analysis using NHANES data from 1999 to 2008 by Han and Powell, found that across all ethnic groups in the US, non-Hispanic whites reported the lowest SSB consumption among children and adolescents.[34] Additionally, non-Hispanic Asian boys and girls aged 2-19 years consumed the least calories and the lowest percentage of total calories from SSB compared with non-Hispanic white, non-Hispanic black, and Hispanic boys and girls.[13] Black children reported a higher intake compared to non-Hispanic children, and those defining their race as "other" reported a higher intake of SSB before adolescents.[15] Black adolescents reported consuming the most SSB, more than their non-Hispanic white, and Hispanic counterparts, and those reporting their race as "other."[15] Among boys, non-Hispanic white (176 kcal), non-Hispanic black (167 kcal), and Hispanic (156 kcal) boys had a higher caloric intake from SSB on a given day compared to non-Hispanic Asian boys (73 kcal).[13] Non-Hispanic black girls had the highest caloric intake from SSB (156 kcal), followed by non-Hispanic white (124 kcal), Hispanic (115 kcal), and non-Hispanic Asian girls (58 kcal).[13] Non-Hispanic white and Hispanic boys had a higher caloric intake from SSB than non-Hispanic white and Hispanic girls.[13]

The percentage of total daily calories from SSB was similar for non-Hispanic black (7.9%), non-Hispanic white (7.6%), and Hispanic (7.3%) boys, all of which

were higher than for non-Hispanic Asian boys (3.5%).[13] Non-Hispanic black (8.9%), non-Hispanic white (7.5%), and Hispanic (6.8%) girls all consumed a higher percentage of total daily calories from SSB than non-Hispanic Asian (3.6%) girls, while non-Hispanic black girls consumed a significantly higher percentage than Hispanic girls.[13] Non-Hispanic black girls (8.9%) consumed a significantly higher percentage of total daily calories from SSB than non-Hispanic black boys (7.9%).[13]

Differences in SSB consumption by socioeconomic status (SES) have also been reported. NHANES data show that children from low-income households had higher SSB consumption and caloric intake from SSB compared to children from higher-income households.[15]

Overall, current NHANES data from the 2015-2016 cycle reports that the total added sugar intake from SSB for children and adolescents 2-19 years of age is 18.5% and 15.8% for adults.[35]

Contribution of Sugar-Sweetened Beverages to Added Sugar Intake

The term “added sugars” was first used in the 2000 US Dietary Guidelines for Americans to highlight foods and beverages that were higher in calories but lacked other important nutrients.[11] SSB contribute calories and added sugars to the diets of U.S. children, and are the single largest source of added sugar and the top source of energy intake in the U.S. diet.[29] In general, added sugars contribute to a diet that is energy dense but nutrient poor, and is associated with an increased risk for obesity, cardiovascular disease, hypertension, obesity-related cancers, and dental caries.[11]

The 2015-2020 Dietary Guidelines for Americans report that most children and adults consume well over the recommended limit of calories from added sugar.[1]

A cross-sectional study conducted in 2014 by Drewnowski et al, evaluated sources of added sugars in the diets of a representative sample (n=31,035) of US children and adults by food purchase location and food source, using NHANES data from 2003 to 2010.[18] In addition, added sugar consumption by food purchase location was evaluated by age, family income-to-poverty ratio, and race-ethnicity. The results indicated that added sugars accounted for over 14% of total dietary energy.[18,36] Between 65% and 76% of added sugars came from stores depending on age.[36] Lower-income adults obtained a significantly greater proportion of added sugars from stores than did higher-income adults.[18] SSB were the largest food group sources of added sugars (34.4%).[18] The authors noted that since most added sugars came from foods purchased at grocery stores, proposed changes to the Nutrition Facts Label may serve to reduce added sugar consumption.

Health Implications Associated with Sugar-Sweetened Beverages

There has been a substantial number of studies investigating the health of effects of SSB over the past decade.[8,30,31,37,38] Using a variety of designs, many have suggested an association between SSB and dental caries, weight gain, type 2 diabetes, dyslipidemia, and nonalcoholic fatty liver disease in children.[7,12,13,39,40]

Most research on SSB consumption and health outcomes among children has focused on obesity.[30,31,37] For example, DeBoer et al, evaluated longitudinal and cross-sectional relationships between SSB consumption and weight status among

children aged 2-5 from the Early Childhood Longitudinal Survey-Birth (ECLS-B) Cohort.[41] The ECLS-B is a large multisource, multimethod study sponsored by the National Center for Education Statistics (NCES), U.S. Department of Education.[41] The study results showed that higher rates of SSB consumption were associated with higher BMI z scores among children aged four and five. Children aged 5 years who drank SSB regularly were more likely to be obese.[41] The prospective analysis showed that children drinking SSB at 2 years had a greater subsequent increase in BMIz score over the ensuing 2 years. The authors concluded that, similar to older children, children age 2 to 5 years who drink SSB have higher BMI z scores.[41]

A similar study by Vartanian et al examined SSB as a major contributor to health disparities.[42] This was a meta-analysis of 88 studies that examined the association between SSB consumption and nutrition and health outcomes. While the studies in this meta-analysis varied in their design (i.e., cross-sectional, longitudinal, or experimental studies), the authors focused on research investigating the effects of SSB. The authors noted associations of SSB with increased energy intake and body weight; lower intakes of milk, calcium, and other nutrients; and an increased risk of several medical problems (e.g., diabetes).[42] The authors concluded that there was a clear and consistent association between SSB consumption and increased energy intake and weight gain due to increased energy intake with little accompanying nutrition.

An 18-month randomized-controlled trial (RCT) of primarily normal-weight children from 4 years 10 months to 11 years 11 months of age was conducted to

study the consumption of SSB and its association with weight gain. Participants were randomly assigned to receive 8 oz per day of a sugar-free, artificially sweetened beverage (sugar-free group) or a similar sugar-containing beverage that provided 104 kcal (sugar group). The beverages were distributed through schools. The results indicated that weight increased by 6.35 kg in the sugar-free group as compared with 7.37 kg in the sugar group. The authors concluded that "masked replacement of sugar-containing beverages with noncaloric beverages reduced weight gain and fat accumulation in normal weight children."[3]

A 1-year RCT with a 1-year follow-up, designed to impact BMI by decreasing consumption of SSB, assigned 224 overweight and obese adolescents who regularly consumed SSB. The emphasis was on displacing SSB with noncaloric beverages in the home as a strategy to decrease consumption.[4] The intervention consisted of home delivery of noncaloric beverages (e.g., bottled water and "diet" beverages) every two weeks.[4] The effect on BMI at the end of 1 year was significant (-0.57) and weight (-1.9 kg).[4] The authors' concluded that replacement of SSB with noncaloric beverages did improve body weight at the end of the 1-year intervention period.[4]

Malik et al conducted a systematic review and meta-analysis to examine the relationship between SSB and body weight in children and adults.[43] The authors searched databases for prospective cohort studies and RCTs that evaluated the SSB weight relationship.[43] Of the thirty-two original articles in the meta-analysis, 20 included children (15 cohort studies, n=25,745; 5 trials, n=2772).[43] In the cohort studies, one daily serving of SSB was associated with a 0.06 and 0.05 unit increase in

BMI in children.[43] RCTs of children showed reductions in BMI when SSB were reduced.[43] The authors concluded that their study provided evidence that SSB consumption promotes weight gain in children.[43]

Although most studies on SSB consumption and children's health have investigated its relationship to obesity, some have included other health outcomes. Many of these health outcomes are associated with adiposity as a risk factor.[37] For example, Nguyen et al evaluated whether SSB consumption is associated with higher serum uric acid levels and blood pressure among adolescents.[44] The authors analyzed cross-sectional data from 4867 adolescents aged 12 to 18 years in the NHANES, 1999-2004. Results indicated that SSB consumption was positively associated with blood pressure. Using the same cohort, Welsh et al measured the impact of high consumption of added sugars from both foods and beverages on measures of cardiovascular disease (CVD) and cardio-metabolic risks (n=2,252).[45] While pointing out that CVD is the leading cause of morbidity and mortality among U.S. adults, the authors noted that the risk factors are increasingly present among adolescents and children with an apparent tendency to track into adulthood. Results indicated that consumption of added sugars was positively associated with multiple measures known to increase CVD risk and concluded that there is a need for early and effective prevention efforts.[45]

A third NHANES 1999-2004 study by Kosova et al evaluated the relationships between SSB intake and cardiometabolic markers among 4,880 participants aged 3 to 11 years.[46] The authors found that SSB intake was

independently associated with increased C-reactive protein concentrations, increased waist circumference, and decreased high-density lipoprotein cholesterol concentrations.[46] The authors concluded that SSB intake was associated with alterations in lipid profiles, increased markers of inflammation, and increased waist circumference in children.[46]

Other studies have found positive associations between SSB intake and type 2 diabetes. A systematic review by Imamura 2016 was conducted to examine the prospective associations between SSB and type 2 diabetes.[47] They reported that habitual consumption of SSB was associated with a greater incidence of type 2 diabetes, independent of adiposity.[47] The authors concluded that: "under the assumption of causality, consumption of sugar-sweetened beverages over the years may be related to a substantial number of cases on new onset diabetes."[47]

Obesity, poor diet quality, and subsequent health outcomes are major public health concerns worldwide.[8,48] Childhood obesity is one of the greatest public health concerns, due in part to the increased prevalence over the past 30 years.

Childhood Obesity

Childhood obesity affects roughly one in six (13 million) children in the U.S., disproportionally impacting children who reside in low-income households, and racial and ethnic minorities.[49] Childhood obesity increases the risk of obesity in adulthood and can lead to negative health outcomes and related health care costs.[49] Per an examination of the NHANES 2015-2016 cohort, the rate of obesity was 18.5% among children and adolescents aged 2-19 years.[48] The obesity prevalence was

13.9% among 2 to 5-year-olds, 18.4% among 6 to 11-year-olds, and 20.6% among 12 to 19-year-olds.[48] Childhood obesity is also more common among certain populations according to this report. Hispanics (25.8%) and non-Hispanic blacks (22.0%) had higher obesity rates than non-Hispanic whites (14.1%).[48] Non-Hispanic Asians (11.0%) had a lower obesity prevalence.[48]

The Healthy People 2020 target obesity rate for children and adolescents is 14.5%. However, the prevalence of overweight (BMI>/= 95th percentile, 30%) is expected to nearly double by 2030.[50,51] Additionally, total health-care costs attributable to obesity and overweight may more than double every decade.[52,53] By 2030, health-care costs attributable to obesity and overweight could range from $860 to $956 billion, which would account for 15.8-17.6% of total health-care costs, or for one in every 6 dollars spent on health care.[52,53]

Recommendations Regarding Sugar-Sweetened Beverages

Consumption of SSB is a public health concern because of its association with childhood obesity and other health outcomes. To address this health concern, many authoritative bodies have issued guidance and recommendations for healthy beverage intake.[1,54] Given the importance of beverage consumption and establishing healthy dietary patterns in early childhood to help prevent future diet-related chronic diseases, Healthy Eating Research, a national program of the Robert Wood Johnson Foundation, convened an expert panel.[54] Representing four key national health and nutrition organizations, the panel developed comprehensive recommendations for beverage consumption consistent with a healthy diet for

children from birth to age five.[54] The organizations represented on the panel included the American Academy of Pediatrics, American Heart Association, the Academy of Nutrition and Dietetics, and the American Academy of Pediatric Dentistry.[54] The resulting recommendations provided evidence-based guidance on beverage for young children. Beverages recommended included water and plain milk with specific limits on 100% juice; and no SSB.[54]

The World Health Organization (WHO) recommends limiting added sugar intake to less than <10% of total calories, with increased benefits of reducing intake to less than 5% of calories.[8,55] The 2015-2020 Dietary Guidelines for Americans also recommend that Americans limit added sugar intake no more than 10 % of daily calories.[1] The American Heart Association recommends that children under age 2 consume no products with added sugar.[55,56] In addition, children ages 2-18 should consume less than 25 grams of added sugar daily (6.25 teaspoons), and no more than 8 oz. of SSB per week.[55]

The American Academy of Pediatrics recommend reducing the intake of SSB because strong evidence that children who consume higher amounts of SSB have higher body weights compared with those who drink less.[57,58] This body also recommends that pediatric health care providers become more involve in schools, advocating for healthier foods and activities.[55,58,59] Lastly, both the American Medical Association and the American Academy of Pediatrics recommend that children ages one to six years be encouraged to consume whole fruit instead of 100% fruit juice.[59]

Policies to Reduce Sugar-Sweetened Beverage Consumption Among Children

As the prevalence and costs of overweight and obesity in U.S. children escalates, local, state and federal policies and strategies have been implemented to decrease children's intake of SSB.[37] Examples include excise taxes; regulations of marketing SSB to children; policies designed to reduce SSB availability in schools; and policies to enhance nutrition labeling.[37] While some of the measures have been successful in reducing the intake of SSB among children, there have also been a variety of unsuccessful legislative attempts, such as SSB warning labels, portion size caps, and restrictions on the purchase of SSB using SNAP benefits.[31] There has also been push back from the SSB industry, as well as from some researchers, policy makers, and the public due to financial and ethical implications.[15] According to Momin et al, much of the controversy focuses on whether policies aimed at reducing SSB availability of consumption will have any effect on child obesity.[15]

Marketing of Sugar-Sweetened Beverages

The beverage industry spends hundreds of millions of dollars every year to advertise SSB to children and adolescents.[60] Advertising exposure for SSB is associated with increased consumption.[60] In 2011, the Rudd Center for Food Policy and Obesity issued the first Sugary Drink FACTS.[60] That report noted that beverage companies extensively market sugary drinks to children and teens almost everywhere they spend their time. Children and youth are exposed to marketing from television, billboards, magazines, signs in grocery stores, and public places,

and now increasingly on technology such as smartphone apps, video games, and emails.[37,60]

Marketing is considered to be effective in influencing children's preferences. Evidence of this is the observation that SSB consumption among children and adolescents is associated with time spent watching television or viewing marketing advertisements.[16] This relationship does not seem to differ by socioeconomic status.[61] A study by Andreyeva et al employed a nationally representative sample from the Early Childhood Longitudinal Survey-Kindergarten Cohort (ECLS-K) and the Nielsen Company data, to study exposure to marketing SSB to children and adolescents, across the top 55 designated-market areas for the purpose of estimating the relationship between exposure to food advertising on television and children's food consumption and body weight.[62] The children were followed from kindergarten in the fall of 1998 (n= 19,684) to the spring of their 8th grade (2007).[62] The survey collected data from multiple sources, including children via questionnaires and direct assessment in school, their parents interviewed by phone, and teachers and school administrators surveyed through questionnaires.[62] The ECLS-K participants were selected via a multistage probability sampling design and some racial/ethnic groups were oversampled.[62] The authors reported that the higher the percentage of advertisements for soft drinks in a market area, the greater the odds of SSB consumption in children.[62] Children are considered uniquely vulnerable to commercial advertising and promotion because they are unable to differentiate information from advertising.[15,63]

Due to the concerns about industry marketing and advertising to children, health advocates have launched public health campaigns to increase awareness of the negative health effects of SSB and reduce their availability.[64,65] For example, the Children's Food and Beverage Advertising Initiative was launched in 2006 by the Council of Better Business Bureau to address advertising that targets children and youth.[66] The food and beverage companies that signed on to this agreement voluntarily agreed to either reduce advertising to children or to focus on advertising products that are defined to be healthier to children under the age of 12 years.[65]

Despite the existence of this initiative, children and adolescents are frequently exposed to SSB advertisements.[55] In 2012, the Federal Trade Commission reported that beverage companies spent $395 million in youth directed advertisements.[67] Overall, SSB advertisements have increased substantially since 2007.[68] For example, a 2012 online survey of US adolescents ages 12 to 17 years (n=847) revealed that almost half of the adolescents reported daily SSB exposure.[69] Among survey respondents, African American male adolescents reported the highest exposure of advertising to SSB.[69] According to Kumar et al, because children tend to consume the beverages promoted on television and because African American children are exposed to the most SSB advertisements, the disparity in SSB advertising exposure may contribute to the disproportionate rates of obesity among African American children.[69]

School Policies Related to Sugar-Sweetened Beverages

School-based interventions have the potential to impact millions of children nationwide, and a growing body of evidence shows that school-based policies can help reduce children's SSB intake.[52,70] Changing the school environment to support healthy eating is important for improving children's health and addressing disparities in overweight and obesity.[70] In addition, childhood represents an important period given that dietary preferences and habits tend to track into adulthood.[71] Many leading public health authorities like the Institute of Medicine (IOM) recognize the critical role schools play in preventing and reducing childhood obesity.[70,72] According to the IOM, schools are an essential setting for policies aimed to improve the diets of children and adolescents,[73] considering that children consume over one-third of their daily intake while at school.[73] A nationally recognized research program of the Robert Wood Johnson Foundation called "Bridging the Gap," reported that the foods and beverages available in schools are associated with the nutritional intake and weight of children across all grade levels.[70]

After significant advocacy, major efforts were undertaken to reduce SSB consumption in schools.[37] An example from the private sector is the School Beverage Guidelines, an initiative of the American Beverage Association that recommended the ban of full-calorie soft drinks and beverages that exceed 66 kcals per 8 oz in K-12 schools.[37] In the past, these same beverage companies targeted

public schools to promote their product sales, in exchange for providing funding to support the school's education and athletic programs.[74]

Perhaps the most significant example of an effort from the public sector was the Healthy Hunger-Free Kids Act of 2010, that established nutrition standards for competitive food and beverage products in schools that participated in Federally reimbursable meal programs.[75] This act required the USDA to establish national nutrition standards for all foods sold in schools at any time (Smart Snacks standards). The adopted standards did not allow SSB in elementary or middle schools and only allow drinks other than 100% fruit juice, milk, or approved milk alternatives if they contain less than 40 kcal per 8 oz or less than 60 kcal per 12 oz for high schools.[75] As a result, a downward trend in the availability of SSB for purchase in schools was noted nationwide with the percentage of students who could access SSB falling from 35% in 2007 to 18% in 2014 for middle school, and from 47 to 29% for high school students.[70] These findings show that there have been important improvements in the nutrition environment of U.S. schools, as children spend up to eight hours a day in school with a significant proportion of their food being consumed there.[37] A 2018 final rule allows states flexibility to include flavored low-fat milk, in addition to flavored nonfat milk, as long as school meals stay within calorie requirements.[55,75]

A systematic review and microsimulation model by Gortmaker et al, estimated the cost-effectiveness of nutrition interventions on obesity over the period 2015-2025, and predicted that the national nutrition standards for all school

meals would likely prevent 1.8 million cases of childhood obesity.[76] Additional evidence indicates that adolescents drink fewer SSB when standards such as these are implemented.[52,77-79] Ultimately, the Healthy, Hunger-Free Kids Act and Smart Snacks standards improved children's nutrition and reduced intake of sugars.[55,80,81]

Nutrition Labeling of Sugar-Sweetened Beverages

The beverage industry has used nutrition labeling to increase consumption of SSB, as labels are particularly effective in communicating messages to the public.[37] Providing information regarding ingredients (e.g., all natural, caffeine free), is one example to help inform consumers about the nutritional content of foods.[65] Two of the most well-known examples of labels are the "health star" ratings adopted in Australia, and the "traffic light labels" adopted in the United Kingdom.[15] Health star ratings assign packaged foods a rating from ½ a star to 5 stars, the higher the star, the healthier the choice.[15] Traffic light labels give information which is color coded red, yellow, and green by increasing health status.[15] In the U.S., Food and Drug Administration has established new requirements for the Nutrition Facts label for packaged foods, which manufacturers must comply with by January 1, 2020.[15,82] One change specific to SSB, is that "added sugars" are now to be included, in addition to the current information on carbohydrate content.[82]

Studies have examined the potential effects of other nutrition labeling content on SSB perceptions.[37] A recent study by Roberto et al, examined the influence of SSB health warning labels on parents' purchase decisions.[83] In this study, 2381 parents from diverse backgrounds participated on an online survey and

were randomly assigned to different conditions: no warning label, calorie label, one of four text versions of a warning label (e.g., Safety Warning: Drinking beverages with added sugars contributes to obesity, diabetes, and tooth decay).[83] Parents were then asked to select a beverage for their child, and rate their perceptions of different types of beverages, and indicated interest in receiving beverage coupons.[83] Results indicated that fewer parents chose an SSB for their child in the warning label conditions.[83] Parents in the warning label conditions also chose fewer SSB coupons, believed that SSB were less healthy for their child, and were less likely to intend to purchase SSB.[83] The authors concluded that health-warning labels on SSB may improve parents' understanding of health conditions associated with SSB and ultimately reduce purchases.[79,83]

Another labeling study by Hartigan et al analyzed points-of-sale of SSB in a large not-for profit hospital in San Diego, Ca.[84] In this interrupted-time-series study, traffic-light labelling was used, and healthier beverages were placed at eye-level in cafeteria coolers and vending machines, and educational and promotional activities including point-of-sale posters explaining the traffic-light system was implemented.[84] All the drinks in the cafeteria, vending machines, and room service menus were labeled as 'red', 'yellow', or 'green' based on sugar content.[84] The participants of this study were hospital staff, patients, and visitors. Results showed that the sales of beverage items labeled red (mainly SSB) decreased from 56% to 32% at the end of data collection period.[84] The share of green-labeling beverage items sold increased from 12% to 38% at the end of the data collection period. The

author concluded that the intervention to reduce SSB consumption had promise and moderate certainty on its effectiveness to do so.[84]

The momentum of policies to reduce SSB consumption continues to build,[85] with environmental interventions aiming to reduce access and campaigns to enhance awareness.

Environment Interventions and Healthful Beverage Choices

Public health professionals have become increasingly interested in how environments support or hinder healthful behaviors, including behaviors related to the food environments.[86] Various interventions intended to reduce SSB intake and its effects on health have been implemented to date. According to one review, two approaches can be distinguished as interventions to reduce SSB intake.[87] The first approach is environmental, targeting the physical, socio-economic, socio-cultural or legal environments, in which individuals make beverage choices.[87] The second approach is behavioral which targets dietary preferences, knowledge, attitudes, motivations, skills and abilities of individuals, as well as their perceptions of social norms on food and beverage consumption.[87] According to the CDC, interventions can be classified by their level of implementation.[9] An example of this is policy interventions, that may be adopted and implemented at the national, state, or municipal level.[87] Another example is setting-based interventions, which are adopted and implemented within individual settings, such as schools, work sites, local retail, food service or recreational facilities.[87] Some interventions are both policy and setting-based with goals of reducing SSB consumption.[87] Examples

include bans on the sale of SSB in schools, which may be mandated at the local level, or by national legislation as part of a national nutrition policy.[87] Similarly, interventions such as labeling are often evaluated by trials within specific settings, before they are implemented at the policy level.[87] According to a systematic review by von Philipsborn et al,[87] all environmental nutrition interventions aim to change human food and beverage. Similarly, the NOURSIHING framework, developed by the World Cancer Research Fund International, distinguishes environmental interventions as those that aim to alter the food and beverage environment in a permanent way.[87] In addition, this body and the CDC describe interventions intended to reduce SSB intake that target the environment in which individuals make food and beverage choices.[9]

Home Environment

Environmental characteristics represent a promising path to improve children's eating habits and reduce the risk of childhood obesity.[88] Children's eating patterns are strongly influenced by home environmental characteristics.[88] For example, children with access to SSB in the home environment are more likely to drink these beverages.[89] Therefore, home and family environments are essential in the development of healthy food and beverage preferences and habits for children.[88]

Research suggests that parents have a primary influence on children's general nutrition intake through reinforcing healthy eating and providing access to food in the home.[89] Characteristics of the home food environment, including food availability, procurement, and preparation practices; are associated with dietary

quality and may be an appropriate target for health promotion interventions.[90] Food shopping decisions for households presents a means of assessing possible pathways between food environment, diet and health outcomes, including highly prevalent chronic diseases such as diabetes and obesity,[91] given that the typical American diet does not correspond to federal nutrition guidelines.[90]

Food shopping decisions for preparing meals at home can result in healthier food intake.[92] Parents and other caregivers contribute to children's eating habits and diet quality through the environment by making healthful foods available in the home.[93] The person who makes food purchasing and preparation decisions in the home environment is referred to as the "nutritional gatekeeper."[92] The "nutritional gatekeeper" influences about 72% of what the family eats.[92] In addition, almost 70% of calories and 80% of snacks consumed by children are eaten at home.[93] Consequently, children's dietary intake is greatly influenced by the home food environment.[93]

An RCT study by Fulkerson examined the home food environment and nutrition-related parent child outcomes of the Healthy Home Offerings via the Mealtime Environment (Home) Plus program, a childhood obesity prevention that promoted healthful food environments.[93] Participants, children age 8 to 12 years (n=160) and their parents were randomized to intervention (n=81) or control (n=79).[93] The intervention included five parent goal setting calls and ten monthly sessions delivered to families that focused on nutrition activities and education, meal planning, cooking skill development, and reducing screen time.[93] Results

indicated that compared with control parents, intervention parents showed greater improvement over time in scores identifying appropriate meal portion sizes. The intervention children were less likely to consume at least one SSB daily at post-intervention than control children.

Another home environment study was conducted by Woodruff et al, using the Healthy Homes/Healthy Families intervention for improving dietary quality.[90] This intervention involved coaching to improve the home food environment, and subsequently to improve dietary quality. In this study, low-income overweight and obese women (n = 349) were recruited from rural community health centers and were randomized to receive a 16-week home environment—focused coaching intervention or health education materials by mail. Healthy Eating Index (HEI)—2010 scores were calculated from two 24-hour dietary recalls collected at baseline and 6- and 12-month follow-up.[90] Results showed that intervention participants reported greater improvements in HEI—2010 total scores at the 6-month follow-up.[90]

Interventions that target ethnically diverse households may help certain populations at a higher risk for obesity.[94] For example, a comparison study on the facilitators of SSB and water consumption among obese/overweight Latino youth in the home environment was examined.[89] In this study, interviews were conducted with 55 overweight/obese Latino youth age 10 to 18 and 55 parents, recruited from school-based clinics and a school in one West Coast district in Los Angeles Unified School District.[89] All youth consumed SSB regularly and lived at home where SSB

were available. The authors used qualitative methods to examine key themes around beliefs about SSB and water, facilitators of SSB and water consumption, and barriers to reducing SSB consumption. Results showed that few parents and youth believed that sports drinks were healthy, most parents and about half of youth thought that water was healthy, and most parents and about half of youth thought that tap water was unsafe. Home availability was seen as a key facilitator of SSB consumption. About half of the households had no rules about SSB consumption. The authors concluded that obesity programs for Latino youth should address misconceptions around water and should discuss culturally relevant drinks as potential sources of weight gain.[89]

Research on the home food environment of low-income households including those enrolled in the Supplemental Nutrition Assistance Program (SNAP) is more limited than research among the general population.[95] Several studies have shown that SNAP participation is associated with unhealthy eating behaviors such as higher SSB consumption, and poorer overall diet quality compared with the eating behaviors of income-eligible nonparticipants.[96-101] Many environmental factors influence the shopping behaviors of low-income and SNAP participants, including the price, availability, and accessibility of food.[100] For example, a study by Lorts et al, evaluated whether the community food environment is a potential moderator of the association between SNAP participation and eating behaviors.[100] This cross-sectional data used participants from a telephone survey of 2,211 households in four cities in New Jersey from 2009 to 2010 and 2014.[95] Food outlet data were purchased from InfoUSA and Nielson in 2008, and classified as

supermarkets, small grocery stores, convenience stores, or limited service restaurants. Analysis was limited to 983 respondents (588 SNAP participants) with household income below 130% of the federal poverty level. Results indicated that SNAP participation was associated with a greater consumption of SSB when respondents lived within ¼ to ½ mile of a small grocery store and supermarket.[100] SNAP participants who did not live close to a convenience store reported a lower SSB consumption.[95] The authors concluded that the food environment might play a role in moderating the association between SNAP participation and eating behaviors.[100]

A similar cross-sectional study by Lacko et al examined differences in self-reported dietary intake by food source for SNAP participants compared with income-eligible nonparticipants.[98] This study included 2,523 adults with low incomes (≤130% of the federal poverty level) from NHANES, 2011-2014. Participant's self-reported intake of calories, solid fats, added sugars, and servings of nonstarchy vegetables, whole fruits, and whole grains was assessed by food source. Of the 2,523 adults included, 47.2% reported current participation in SNAP. SNAP participants were more likely to be women, identify as non-Hispanic black, and received Special Supplemental Nutrition Program for Women, Infants and Children (WIC) benefits. SNAP participants reported consuming a greater percentage of daily total calories from food obtained from grocery stores than did nonparticipants. SNAP participants and nonparticipants consumed similar total calories, a similar proportion of total calories from solid fat, and similar equivalents of whole grains. Compared with nonparticipants, SNAP participants consumed a

higher proportion of total calories from added sugar, fewer servings of nonstarchy vegetables, and fewer servings of whole fruit.[98]

Community Food Retail Environment

A geographic food retail environment study by Schwartz et al, collected data on a large sample of SNAP households, to investigate whether proximity to healthy food retailers was correlated with how SNAP households spend their benefits.[102] Specifically, if food retail access might differ depending on whether a household is located within or without a given distance from the nearest supermarket (e.g., one mile). Schwartz investigated food shopping outcomes and the food retail environment among over 40,000 households receiving SNAP benefits in western Massachusetts. The data was collected through the Healthy Incentives Pilot evaluation, which was conducted under the Office of Policy support in the Food and Nutrition Service, USDA. This 2017 study found small significant negative associations between continuous distance and both the percentage of SNAP redemptions spent at supermarkets, and the number of benefit-spending trips taken to supermarkets. Nonetheless, SNAP households located in neighborhoods with what would be considered poor access to supermarkets still spent more than 75% of their redemptions at these retailers, only five percentage points lower than households located one block from a supermarket. The results indicate that SNAP participants' inability to reach healthy retailers (e.g., convenience stores) in the retail food environment is at most a minor driver of geographic disparities in nutrition and health outcomes.[96] The result of this study is similar to other studies

at both local and national scales have found that most shoppers travel beyond their closest supermarket to do most of their food shopping.[97,103,104]

Although there is a growing body of evidence to show that the distribution of the food retail environment may affect individual choices across multiple socioeconomic environments, there is a limitation to these studies and that is they have focused only on the residential neighborhood environment (urban and/or rural areas).[105] A study by Dornelles et al found there is increased evidence that both the residential and non-residential environments, promotes an unhealthy consumption of food and beverages, physical inactivity, and energy imbalance.[105] Dornelles investigated the association between BMI and the food environments across SES in people's neighborhoods, at their work locations, and along community corridors. This study accounted for multiple food environments, and the food environment based on participants' commuting. The authors examined the relationship between characteristics of three distinct food environments and BMI among elementary school employees in New Orleans, LA. This cross-sectional secondary analysis of 866 participants in the ACTION cohort combined data from three different sources: individual worksite data (ACTION), food retailer database (Dunn and Bradstreet), and the U.S. Census TIGER/Line Files. The results showed that when the three food environments were combined, the number of supermarkets and the number of grocery stores at residential food environments was associated with an increase in BMI, whereas the number of full-service restaurants showed an inverse relationship. For the commute corridor food environment, it was found that each additional fast-food restaurant in a close

vicinity contributed to a higher BMI. The majority of the respondents were white and between 40-59 years of age. The mean BMI was 29.4. The majority were classified as either obese (41.7%) or overweight (29.3%). The average daily distance traveled was 18.4 kilometers, and the daily commute was 25.2 minutes. The food environments examined in this study were based on participants' home and work addresses, while most previous studies gather residential information by census tract level, ZIP codes, or block groups, illustrating the importance of multiple environmental factors in relation to BMI.[105]

Grocery Store Environment

In an effort to improve the dietary quality of residents in communities with limited access to healthy foods, public health researchers have paid increasing attention to community food environments.[105] Knowing what draws shoppers to particular locations, can be helpful in designing public health initiatives, aimed at improving dietary quality through environmental changes related to retail food access.[105] Food shopping decisions in grocery stores are pathways between the food environment, home environment, and diet health outcomes, including chronic diseases such as diabetes and obesity.[91,97] The retail food environment and its potential association with obesity has been the subject of considerable research for over a decade.[106] Greater access to supermarkets in disadvantaged urban and rural communities holds promise for promoting healthier diets.[107]

Disparities have also been identified at the consumer-level (i.e., what is encountered within a store), which involves features increasingly linked with health

behaviors and outcomes (e.g., purchases, weight status).[107] However, limited research has examined whether consumer-level disparities exist among small and non-traditional food stores. A study by Winkler et al examined differences in consumer level characteristics of small and non-traditional food retailers (i.e. corner stores, gas-marts, pharmacies, dollar stores) by racial segregation of store neighborhood and corporate status.[108] Data was collected as part of a larger study, STORE (STaple Foods ORdinance Evaluation); an experiment evaluating a local ordinance which created minimum stocking requirements of healthy foods for the city of Minneapolis, Minnesota. One hundred and thirty-nine stores; 78 managers were assessed, and manager surveys were used to examine availability, affordability, and marketing-related characteristics experienced by consumers and perceived capabilities for healthful changes. Results showed that several consumer- and – structural-level differences occurred by corporate status, independent of residential segregation. Independently owned stores, corporate/franchise-owned stores were more likely to: not offer fresh produce; when offered, receive produce via direct delivery and charge higher prices; promote unhealthier consumer purchases; and have managers that perceived greater difficulty in making healthful changes. Only two significant differences were identified by racial segregation. Stores in predominantly people of color communities (<30% non-Hispanic White) had less availability of fresh fruit and less promotion of unhealthy purchases. The authors concluded that corporate status in the food environment appears to be a relevant determinant of the consumer-level food environment.[108]

Grocery Store Interventions

Grocery stores employ price, placement, and promotion strategies to sell food and beverages.[109,110] Since the first step to improving dietary patterns requires modifying purchases, or otherwise acquiring a nutritious mix of foods; the food retail setting represents a critical decision point for the majority of food acquisitions.[111] The majority of household food expenditures are still spent on food purchased at grocery stores for at home preparation and consumption.[111] This is particularly true for low-income Americans.[111] According to the USDA's National Household Food Acquisition and Purchase Survey (Food APS), roughly 90 % of both SNAP and non-SNAP households do their usual grocery shopping at large grocery stores and supermarkets.[111] As Americans purchase almost two-thirds of their calories from large grocery stores, grocery store interventions can play a strong role in promoting healthy purchases. The USDA provides $67 billion in benefits to 44 million Americans.[112] The number one purchases by SNAP households are SSB, which accounted for 5% of the dollars they spend on food.[113] Among non-SNAP households, SSB ranked second on the list of food purchases. Across all households, more money was spent on SSB than any other item.[112,113] While SSB intake has declined overall compared to a decade ago, added sugar intake remains excessive.[1] Finding ways to encourage healthier purchases at grocery stores has the potential to improve diets and ultimately nutritional health of SNAP participants.[114]

Researchers' efforts to identify ways to reduce the SSB purchases in grocery stores have accelerated during the past decade. For example, Schwartz et al

conducted a study to compare beverage sales in Maryland, with sales in comparison stores before and during a three-year campaign.[85] The observational experiment included 15 supermarkets in Howard County in Maryland and 17 comparison supermarkets. The campaign message was to reduce consumption of all SSB. Advertising, digital marketing, direct mail, outdoor advertising, social media, and earned media during the 3-year period were employed and SSB sales were tracked. Results showed that regular soda sales in the 15 supermarkets decreased, whereas sales remained stable in the 17 comparison supermarkets. While there was a decrease in both communities, they were not significantly different. The authors concluded that a "locally designed, multicomponent campaign to reduce consumption of sugary drinks was associated with an accelerated decrease in sales of regular soda, fruits drinks, and 100% juice."[85]

A labeling intervention by Cawley et al studied the impact of a nutritional rating system on consumers' food purchase in supermarkets. The Guiding Stars rating system assigned scores of zero, one, two or three stars (with 3 being the most nutritious) on store shelves to indicate better nutrition value.[115] The intervention was implemented 168 supermarkets belonging to one supermarket chain in the Northeastern US from January 2005 to December 2007. The analysis was based on sales data collected during a 16-month intervention phase. Results indicated that there was a significant decrease in the sale of less nutritious foods, however there was no change in the sale of nutritious foods. The authors concluded that the nutrition rating system intervention in supermarkets appears to be a useful health intervention.[115]

A point-of-purchase is one type of grocery store intervention,[116] used in the promotion to purchase healthier foods.[114] A point-of purchase study by Milliron et al tested the efficacy of a multi component supermarket point-of-purchase intervention featuring in-person nutrition education on the nutrient composition of food purchases.[117] This randomized trial in a supermarket in a socioeconomically diverse region of Phoenix, AZ. The 153 adult shoppers were recruited onsite and were provided with a brief shopping education by a nutrition educator and an explanation of posted shelf signs identifying healthful foods. The intervention resulted in greater purchases of fruit and dark-green/yellow vegetables. The authors concluded that evaluations of supermarket interventions should be conducted to determine the potential for influence on food choices associated with health promotion and decreased chronic disease incidence.[117]

A similar study by Moran et al evaluated the effects of a supermarket meal bundling and electronic reminder intervention on food choices of families with children.[118] The quasi-experimental (meal bundling) and randomized, controlled trial (electronic reminders) was set in large supermarkets in Maine during a 40-week baseline and 16-week intervention period in 2015-2016. Participants were English-speaking adults living with at least one child aged ≤ 18 years (n=300) with 25% of households participating SNAP. The intervention included four bundles of ingredients needed to make eight low-cost healthful meals promoted in the store through displays and point-of purchase messaging for four weeks; and weekly electronic messages sent to study participants reminding them to look for meal bundles in the store.[118] Results showed that there were no differences in spending

on bundled items resulting from the meal bundling intervention or the electronic reminders.[118]

Nau et al designed a financially self-sustaining pricing intervention on sales of SSB and bottled water in two Baltimore corner stores to measure sales and profit under different pricing models to encourage water consumption over SSB consumption.[119] The results showed that a 20% SSB price increase allowed lowering water prices by up to 20% while maintaining profits[119]. Water demand increased by 9% and 14% for stores selling SSB in 12-oz cans and 16- to 20-oz bottles. Without changing the water prices, profits could increase by 4% and 6% respectively.[119] Analysis showed that stores with higher SSB sales could reduce water prices the most without the loss of profit. The authors concluded that various combinations of water prices could encourage water consumption while maintaining or increasing and implementing profitable pricing strategies[119]

The cost of food can be a barrier to healthy eating, particularly among lower-income households with children. In response, some grocery store intervention studies that target low-income households have offered financial incentives on purchases at grocery stores[118] Low-income populations, such as those who participate in SNAP, spend less on healthy foods like fruits and vegetables than do higher income populations. [120]Additionally, compared with nonparticipants, SNAP participants consume more refined grains, processed meats, and SSB and fewer fruits and vegetables[120]

A financial incentive intervention aimed at purchasing healthier foods was a conducted by Polacsek et al.[120] This pilot study was conducted in a low-income supermarket in rural Maine to determine whether a supermarket double-dollar fruit and vegetable incentive increases fruit and vegetable purchases among low-income families.[120] Study subjects (n=401) were supermarket customers who shopped in the supermarket regularly (at least 50% of the time) participated in a three-month baseline data collection period; and were followed during the four-month intervention period. Because the goal was to enroll as many SNAP participants as possible, enrollment occurred in October 2015 during eight sequential days (October 10-17), which overlapped with the dates when Maine SNAP users' monthly benefit is loaded to their EBT card.[120] At the time of enrollment, the research team assisted participants with joining the store's loyalty program that provided a 5% discount to participants during the intervention, which was used to track the ID to track store purchases. Participants also received a same-day coupon at checkout for half-off eligible fresh, frozen, or canned fruit and vegetable over four months. Results showed that coupons were redeemed among 53% of eligible baskets.[120] Total weekly fruit and vegetable spending increased, the largest increase was for fresh fruit and vegetable, and second increase revealed a greater increase in fruit and vegetable spending among SNAP-eligible participants who redeemed coupons than among non-SNAP eligible participants who redeemed coupons.

The grocery store environment facilitates and influences access to both unhealthy and healthy purchases. To encourage healthier purchases, a cluster-

randomized controlled trial by Foster et al was conducted eight urban supermarkets located in low-income, high minority, neighborhoods in Philadelphia, PA, and Wilmington, DE.[107] This study evaluated the effects of in-store marketing strategies to promote the purchase of specific healthier items in five product categories: milk, ready-to-eat cereal, frozen meals, in-aisle beverages, and checkout cooler beverages.[107] Eight urban supermarkets in low-income, high minority neighborhoods were the unit of randomization, intervention and analysis. Stores were matched on the percentage of sales from government food-assistance programs and store size and randomly assigned to an intervention of control group.[107] The four intervention stores received a six month, in-store marketing intervention that promoted the sales of healthier products through placement, signage, and product availability strategies. The four control stores received no intervention and were assessment-only controls. The main outcome measure was weekly sales of the targeted products, which was assessed based on the stores' sales data. Results indicated that the intervention stores showed significantly greater sales of skim and 1% milk, water (in aisle at checkout), and two of three types of frozen meals compared with control sales during the same period. No differences were found between the stores in sales of cereal, whole or 2% milk, beverages, or diet beverages.[107]

Need for Additional Research

There is a large body of research documenting the negative impact of SSB on children's health. There is evidence that consumption has begun to decline,[7] indicating that some efforts have been helpful. However, SSB consumption remains excessive among both children and adults. In addition, the USDA reports that the SSB purchases are high among SNAP and non-SNAP households.[111] While the food retail environment has become an increasingly popular location to promote healthful foods and beverages, tested strategies may not be generalizable to all communities and sustainability remains a concern. In addition, there are questions regarding how to effectively modify consumer's behavior at the point-of-purchase in an increasingly competitive and complex food retail system. Lastly, while policy and environmental approaches have appeal among some stakeholders and scholars, objections have been raised among others including advocacy groups and consumers.

Summary

This chapter described trends and patterns of SSB consumption and related health implications. Recommendations and interventions to effectively reduce SSB consumption were explained; including modifications of food environment, such as grocery stores.

Chapter 3

Study Manuscript: Consumers' Opinions of Recipes for Healthful Beverages Distributed at SNAP Authorized Grocery Stores

The following manuscript will be submitted to the *Journal of Nutrition Education and Behavior* as a "Research Brief."

ABSTRACT

Objective: To examine consumers' use and opinions of healthful beverage recipe cards distributed at grocery stores as part of a campaign to reduce sugar-sweetened beverages (SSB) among households enrolled in the Supplemental Nutrition Assistance Program (SNAP).

Use of Theory or Research: Point-of-purchase interventions have been used previously to promote healthful choices in grocery stores and show promise as an effective means to reduce SSB intake.

Target Audience: Consumers who shop at grocery stores located in or near select low-income communities in northern Nevada.

Program Description: Partnerships with SNAP authorized retailers (n=18) resulted in year-round store displays featuring a variety of free recipe cards for seasonal, low-cost beverages with no added sugar.

Evaluation Methods: For four months, displays were stocked with recipe cards inviting consumers to prepare one of the recipes and complete an online survey. The 45-item survey instrument, administered using Survio, assessed consumers'

experiences and opinions. Respondents received a $10 e-gift card. The survey was available until the desired sample size of 250 was achieved.

Results: Over half of respondents (n=252) were living with children (53%) and nearly all were primarily responsible for making household food purchases (84%). The reasons most often endorsed for taking a recipe card were interest in trying a new recipe (47%), the cards were free (47%) and/or wanted to make healthy drinks (44%). A majority strongly agreed/agreed that they learned new ways to save money by making drinks at home (60%) and were more confident they could make healthy drinks that taste good (82%) as a result of the recipe card(s). Few reported that the recipe ingredients were too costly (10%). Those who had prepared the recipe (90%), were satisfied with the beverage as noted by a mean rating of 4.14±1.02 measured using a five-point scale with 1= very dissatisfied and 5= very satisfied. Many had shared the recipe card(s) with others (59%).

Conclusions: Partnerships with SNAP authorized retailers facilitated the distribution of healthful beverage recipes that were positively perceived by consumers. This point-of-purchase strategy has the potential to reduce SSB intake among persons in SNAP-Ed eligible households.

Key Words: sugar-sweetened beverages, children, point-of-purchase, low-income, recipes, SNAP.

INTRODUCTION

The 2015-2020 Dietary Guidelines for Americans report that most children and adults consume well over the 10% recommended limit of total calories from added sugar.[1] Added sugars account for an estimated 18% of total daily energy intake among children 2-19 years.[1] Furthermore, sugar-sweetened beverages (SSB) are the single largest source of added sugars among children in the U.S.[18]

Excessive added sugars are associated with increased risk for obesity, type 2 diabetes and cardiovascular disease.[43,87] Excess consumption of SSB specifically, contributes to dental caries and obesity among children, especially those who are socioeconomically vulnerable.[6]

In recent years, SSB consumption has begun to decline overall for children and adults;[7,13,121] however, rates have remained higher for racial and ethnic minorities.[13,121] There is also evidence that children and adults participating in the Supplemental Nutrition Assistance Program (SNAP), consume more SSB than higher-income nonparticipants,[112] and diet quality is generally worse among SNAP eligible nonparticipants.[99] In light of the evidence that decreasing SSB consumption will lower the prevalence of obesity and related co-morbidities, the need to promote more healthful beverages in lieu of SSB has been addressed by a number of medical and health organizations, including the American Academy of Pediatrics.[8]

Children's eating patterns are strongly influenced by the home environment.[88] Parents and other caregivers contribute to children's eating habits

and diet quality in several ways including their knowledge, behavior and attitudes, as well as the accessibility of foods in the home.[93,122] The majority of household food expenditures are still spent on food purchased at grocery stores for at-home preparation and consumption.[111] This is particularly true for low-income Americans.[114] In regards to added sugars specifically, an examination of the purchase location of foods and beverages, based on a nationally representative of U.S. children, revealed that 65.1% of added sugars came from grocery stores for children 6-11 yrs; 4.3% from quick-service restaurants; and 6.8% from school cafeterias. A greater proportion of added sugars were from quick-service restaurants compared to schools among adolescents, 12-19 yrs (grocery store= 70.3%, quick-service restaurant=11.6%, school=3.8%). These findings add to the body of evidence that access to SSB in the home environment is associated with children's intake.[89]

Because the important role that parents and caregivers have on the dietary quality of young children, and the purchase location and source of added sugars, grocery stores represent a promising intervention site.[123] Point-of-purchase interventions involve modifying the food store environment to promote healthful purchasing patterns.[109,117] Interventions such as signs, posters, front-of-package labels or shelf labels to encourage individuals to purchase healthier food options have been employed[82] in a variety of settings including cafeterias, vending machines, and other retail locations.[124] In a study by Liu et al, food samples, recipe cards, product placement modifications, and promotional discounts on fruits and vegetables were introduced in participating grocery stores as part of "Plate It Up

Kentucky Proud."[19] The primary aim of this study was to examine the effects of a diet-based, social marketing intervention in grocery stores that included recipe cards.[19] A customer intercept survey was conducted to capture the effectiveness of the in-store marketing events. Most survey participants reported that recipe cards influenced their desire to purchase specific ingredients, as well as fruits and vegetables in general. Results indicated a significant association between the influence of recipe cards and frequency of fruit and vegetable consumption.

The follow-up study of "Plate It up Kentucky Proud" by Gustafson et al, named, "Plate It Up Kentucky" found similar results. This study also provided in-store promotions, recipe cards, samples, price reductions, and marketing on shopping carts as a method to promote healthy food purchases.[20] In this study, the customers were asked to provide store receipts as well as participate in an intercept survey assessing grocery shopping practices and dietary intake. Participants were provided with a $10 gift card for completing the survey and providing their receipt. Fruit, vegetable and SSB purchases were computed using receipt data. Results in this study indicated that store customers spent an average of 8% more on fruits and vegetables and reported spending less on SSB.[20]

The study described here represents one component of a larger effort to promote healthful beverage choices and reduce SSB intake among children residing in low-income households. *Rethink Your Drink Nevada* (RYD) was developed using the social ecological model as a framework in combination with social marketing approaches.[125,126] The program components include those targeting individual

knowledge and skills; home, school and grocery store settings; medical and dental care practices; and print and digital media.[21-28,127] In an effort to reduce the availability of SSB within the household, RYD partnered with SNAP approved grocery stores in or near low-income communities in urban and rural communities throughout northern Nevada. At the time of this study, 18 such stores provided space for a free-standing display that included a poster inviting shoppers to take free recipes for healthful beverages. The recipes themselves, developed by the RYD team, are simple to prepare and include low-cost ingredients that require no special kitchen equipment. Most recipes call for a variety of fruits, vegetables, herbs and/or spices to flavor tap or sparkling water; a smaller number are milk-based. Several are marked "For little cooks" and can be safely prepared by young children (e.g., involve no cutting). The recipes were printed full-color on glossy card stock with English text on one side and Spanish text on the reverse. Suggestions for minimizing food waste are offered as appropriate on select cards. The posters and recipe cards were changed approximately each month to highlight seasonal options and maintain consumer interest.

The overall purpose of this study was to examine consumers' use and opinions of healthful beverage recipe cards distributed at participating grocery stores as one component of the RYD program. The objectives of this study were as follows: 1) to describe the sociodemographic characteristics of consumers who had taken recipe cards from the RYD displays; 2) to describe consumers' perceptions of the grocery store where the RYD recipe cards for healthful beverages were distributed; 3) to determine factors that motivated consumers to take the recipe

card(s), their opinions of specific features of the cards, and the extent to which they found the recipe cards to be of benefit; and 4) to assess what behaviors, if any, were modified as a result of recipe cards.

METHODS

Study Purpose and Sample

A cross-sectional survey was conducted among a convenience sample of consumers at 18 RYD participating grocery stores located in or near low-income communities in northern Nevada. The survey was conducted from September 2018 to January 2019 at which time RYD recipe displays stands located in these stores were stocked with both posters and recipe cards inviting consumers to try one of the RYD recipes and complete an online survey. Poster and cards noted that all survey respondents would receive a $10 e-gift card. Intermittent RYD store events provided opportunities to explain the survey purpose in-person to shoppers. A script was prepared for this purpose. [Appendix B]. No other recruitment methods were used.

Survey Instrument and Data Collection

A 45-item survey instrument was developed for the study [Appendix A]. Development began with a review of the scholarly literature to identify variables related to key constructs within each research objective. Next, a panel of faculty members and graduate students (n=5) was used to assess the content validity of resulting domains. For this purpose, panelists were provided with a sequential list of the research objectives, the key construct within the objective, and the

corresponding variables. They were instructed to review the information and to indicate if the list of variables was complete (an indication of content validity). If not, missing variables were recorded. Next, they were asked to rate the relevance of each variable to the construct using a scale from 1 (=not favorable) to 3 (= very favorable). Panelists made their determinations independently and then participated in a facilitated group discussion to explore agreement/disagreement. Next, survey items and response sets were constructed and later reviewed by three experienced nutrition educators for the purpose of assessing readability. The final step was to conduct a small pretest of the survey once it was available online.

The final instrument, titled, "Rethink Your Drink Nevada Recipe Rating Survey" included a combination of closed- and open-ended survey items organized into five parts [Appendix A]. Part I included items about the store where the recipe card(s) were taken including the county where the store was located, and length of time and mode of travel to the grocery store. All response sets were close-ended with the exception of mode of travel which allowed respondents to enter theirs in a character field if it wasn't among those listed. The store locations were later collapsed into two categories consisting of urban (n=2) and rural/frontier counties (n=5) due to the small sample sizes among the rural/frontier counties. The purpose of Part II was to learn their reason(s) for taking a recipe card. Respondents were presented with a list of six reasons and were instructed to select all that applied to them. In addition, they were allowed to enter another reason if theirs wasn't among those listed. Part III of the survey included items to describe whether they had visited the RYD website, shared the recipe cards with others, and/or prepared one

or more of the drinks. If their answers were negative, they were asked about their intention to do so in the next few weeks. If they had prepared a recipe, they were presented with two questions regarding their satisfaction with the drink and the likelihood they would prepare it again. Respondents were also invited to describe anything else they had done differently as a result of the recipe card(s) in a character field. Part IV included items about their opinions of specific characteristics of the recipes cards, including the instructions, cost of ingredients, convenience, and completeness. A five-item summated scale with an agree/disagree response set was developed for this purpose. Also included in Part IV were five items about the perceived benefits of the recipe cards. These too included an agree/disagree response set. The purpose of Part V was to gain information about their opinions of the grocery store where the recipe card(s) were taken. Grocery store characteristics of interest here were the extent to which they were perceived to help stretch food budgets; stock healthful food and drinks; offer good quality for the prices; and support efforts to improve the health of the community. Part VI items related to the respondents' self-reported exposure to other RYD Program components including the direct mail campaign; print and digital media ads; and education from medical and dental care providers. The final part of the survey (Part VII) included items to obtain respondents' sociodemographic characteristics, and the extent to which they were responsible for deciding and buying food and drinks for the household.

Once approval had been granted from the Institutional Review Board at the University of Nevada, Reno [Appendix C], the survey was administered online using

Survio. Respondents were instructed to access the survey via a unique URL or QR code printed on the recipe cards. The link brought respondents to an introduction page that described the purpose and other details about the survey. To proceed to the survey questions, respondents were required to click a button that read "I agree to participate in this survey." Then, the first question presented was, "Are you over the age of 18?" Only those who responded with "Yes" were permitted to participate. At the close of the survey, respondents were instructed to provide their email address, so that the link to their $10 e-gift card could be sent. The survey closed when the desired sample size of 250 was achieved. Posters and cards about the survey were then immediately removed from the RYD grocery store displays.

Data Analysis

Descriptive and inferential statistical analysis were performed using IBM SPSS Statistics version 25.01[28] . A member of the research team coded and analyzed the qualitative data resulting from the open-ended questions using the grounded theory approach. The coding consisted of finding connections between categories that explained the experiences of the participants. Chi-Square tests and Mann-Whitney tests were used to compare select sociodemographic characteristics (i.e., gender, age, participation in nutrition assistance programs and the presence of children in the respondents' household) to opinions of recipe card features and perceived benefits respectively. Statistical significance was set at .05.

RESULTS

During the four-month study period, approximately 21,000 recipe cards were distributed among the participating grocery stores and 252 surveys were completed. The sociodemographic and household characteristics of the survey respondents are described in Table 1. The mean age of respondents was 39.8±13.2 years. Approximately half were female (51%); white (58%); and resided in households with children (53%). A small proportion reportedly participated in SNAP (15%), WIC (11%) or both SNAP and WIC (5%). The highest level of education among 23% of the sample was a high school diploma. As noted in Table 2, nearly 84% of respondents reported that they decided and bought what foods and drinks were available in their home either "most of the time" or "all of the time."

Most respondents had taken the recipe card(s) from a grocery store located in an urban county (88%), that was located 15 minutes or less from their home (70%). Travel to the stores was typically by a private vehicle (Table 3). Respondents' perceptions of the grocery store were generally positive. Most agreed/strongly agreed that the grocery store "…helps me stretch my food budget" (68%); "…stocks plenty of healthy foods and drinks" (71%); "…offers good quality for the prices" (77%); and "…supports efforts to improve the health or our community" (68%).

Reasons most often endorsed for taking a recipe card(s) from the grocery store displays are shown in Table 4. Interest in trying a new recipe was endorsed by nearly half of the respondents (47%), followed closely by the proportion who took the recipe card(s) because they were free (46%) and/or wanted to learn to

make healthy drinks (44%). In addition to the list of reasons presented, respondents were given the option of entering their reason. Ten respondents chose to do so. Of these, common reasons included the chance to earn a gift card; interest of someone who was with them at the time; and their interaction with a member of the program staff. A comparison of reasons endorsed by select sociodemographic/household characteristics (i.e., gender, age category, the presence of children in the household, and participation in either SNAP or WIC) revealed few differences. Using Chi-Square tests for significance, results indicated that respondents who resided in households without children more often took a recipe card because the "display was attractive and clean" (Chi-Square=3.86; df=1; p=.034). Respondents enrolled in either SNAP or WIC less often indicated that they took a recipe card because they "like to try new recipes" (Chi-Square=4.5; df=1; p=.023). No other differences were noted.

Respondents' opinions of specific recipe card features were positive as noted by their agreement/disagreement with the five statements listed in Table 5. After recoding the responses such that a greater number indicated more positive opinions, a score was computed for each respondent by summing across all five items. This score was then compared to the select sociodemographic characteristics named previously using a Mann-Whitney U Test. Results revealed that the cards were more positively perceived among respondents not in SNAP or WIC (Mann-Whitney U=4481; p=.049). No other differences were noted.

The extent to which respondents perceived that that recipe cards were of personal benefit is shown in Table 6. The specific benefits noted here include saving money (60% agreed/strongly agreed); learning how to make drinks that taste good (81% agreed/strongly agreed); new ideas for healthy drinks to make at home (83% agreed/strongly agreed); new information to help keep family members healthy (78% agreed/strongly agreed); and greater confidence in making healthy drinks that taste good (81% agreed/strongly agreed). These results indicate the cards were perceived to be of benefit. After recoding the responses such that a greater number indicated more perceived benefits, a score was computed for each respondent by summing across all five items. This score was then compared to the select sociodemographic characteristics named previously using a Mann-Whitney U Test. No significant differences were noted.

Table 7 lists the percentages of respondents who had modified specified behaviors as a result of the recipe card(s). A large proportion had prepared one or more of the recipes (90%). Of those who had not, 60% indicated they planned to do so in the next few weeks. A smaller number of respondents had shared the recipe card(s) with others (59%) or visited the RYD website (43%). Among those who had reportedly prepared at least one RYD recipe, satisfaction with the results was high as noted by a mean rating of 4.14±1.02 measured using a five-point scale with 1= very dissatisfied and 5= very satisfied. Similarly, these same respondents reported that they were likely to make the drink again as noted by a mean rate 4.13± 0.96 using a five-point scale with 1=very unlikely and 5=very likely.

Finally, the survey assessed the extent to which respondents had reportedly been exposed to other components of the RYD program. As noted in Table 8, 26.6% remembered seeing ads about healthy drink choices for kids on social media; 24.2% recently had a physician or nurse talk to them or their child about healthy drink choices; 23.8.2% remember seeing ads about healthy drink choices for kids on billboards; 15% recently had a dentist or dental hygienist talk to them or their child about healthy drinks; and 10% recalled receiving information about healthy drinks in the mail.

DISCUSSION

The large number of recipe cards distributed at participating grocery stores during a four-month period demonstrates consumer interest in this type of resource. The reasons most often endorsed by the survey respondents for taking a recipe card reflected an interest in trying new recipes for healthful drinks, and wanting something for free. For the purpose of reducing SSB consumption among SNAP households, these findings are important.

The results of this study also indicated that a majority of respondents held positive opinions of the recipe cards and found them to be of benefit. A significant proportion had prepared one of the recipes and were highly satisfied with the results. These findings were similar to other studies that showed the positive effects of distributing recipe cards at grocery stores. For example, Liu et al,[19] found that recipe cards influenced consumers' desire to purchase ingredients like fruits

and vegetables. Similarly, Gustafson et al [20] found that the in-store marketing campaigns resulted in greater purchases of healthful foods and a reduction in SSB purchases. The majority of survey respondents in these two studies were female, white and a smaller portion participated in SNAP and/or WIC – similar to the study population here.

The respondents in this study also reported that they had a positive perception of the grocery store where the recipe card(s) were taken. A high proportion agreed that the grocery stores offered good quality, were stocked with healthful choices, and supported community efforts to promote health. While the extent to which these opinions may be similar or different to consumers of other grocery stores is unknown, it does provide a point of reference for future studies that involve partnerships with grocery stores.

Few significant differences were discovered among select sociodemographic and household characteristics. However, it is notable that respondents enrolled in either SNAP or WIC were less likely to take a recipe card because they liked to try new recipes; and rated the recipe cards less favorably in general, compared to households not enrolled in SNAP or WIC. Additional research may be of benefit to gain a fuller understanding of the preferences and interests of this audience relative to recipes distributed at grocery stores.

The proportion of respondents who had reportedly been exposed to other RYD components revealed that printed ads and social media posts had successfully

reached about a quarter of these consumers. In the Liu et al[19] study less than half of the participants had previously heard of the "Plate It Up Kentucky" program.

The results of this study do raise questions of how best to reach SNAP households in SNAP authorized grocery stores. A small proportion of survey respondents were enrolled in SNAP. The reason for this small response from SNAP households is not known. Further exploration regarding the characteristics of the RYD display would be of benefit.

Limitations of this study include the cross-sectional design and the small, non-representative sample. In addition, the study was conducted over four months in 18 stores in northern Nevada. An examination of the long-term benefits of the intervention and the extent to which the consumers in other areas would have the same opinion of the recipe cards is needed. The survey captured respondents' self-reported behavior and did not include other more objective measures such as food purchase receipts. Finally, the inability to specifically recruit participants from low-income households limits the extent to which conclusions can be made regarding SNAP households. Alternative sampling approaches that result in a representative sample from the target population should be considered in future studies.

IMPLICATIONS FOR RESEARCH AND PRACTICE

This study provides evidence that consumers held positive opinions of the recipe cards for healthful beverages distributed at grocery stores, and as a result of the cards, had prepared recipes at home. The extent to which these beverages were consumed in place of SSB is not known and remains an important area for future

research. Although the findings are not generalizable, the positive results described here adds to the body of evidence that point-of-purchase approaches have great potential to modify consumers' behavior. Additional research is needed to identify and evaluate other approaches that would be suitable and effective for grocery stores located in low-income communities. Grocery stores influence consumers' purchase decisions in many ways and by working closely with owners/managers, nutrition educators have the opportunity to help shape an environment that promotes healthful choices and reduces chronic disease risk.

ACKNOWLEDGEMENTS

This study was funded by USDA's Supplemental Nutrition Assistance Program (SNAP).

Table 1. Sociodemographic and Household Characteristics of Survey Respondents (n=252)[a]

Participant Characteristics	n (%)
Gender	
Female	129 (51.2)
Male	103 (40.9)
Non-binary	6 (2.4)
Education	
1st-11th grade	9 (3.6)
High School diploma or GED	49 (19.4)
Some college	106 (42.1)
College degree	74 (29.4)
Race/Ethnicity	
White	145 (57.5)
Hispanic	34 (13.5)
Asian/Native Hawaiian	23 (9.1)
Black	8 (3.2)
American Indian	6 (2.4)
Age (mean ± SD) [Range]	39.8 ± 13.2 [19-92]
Household Characteristics	
Number of households with children	133 (52.8)
Number persons in household (mean ± SD) [Range]	3.19 ± 1.7 [1-9]
Number of children in household (mean ± SD) [Range]	1.10 ± 1.4 [0-9]
Participate in SNAP	39 (15.5)
Participate in WIC	29 (11.5)
Participate in both SNAP and WIC	13 (5.1)

[a]Percents do not equal 100% due to refusals and/or missing responses.

Table 2. Food and Shopping Roles as Reported by Survey Respondents (n=252)

Roles	None of the time n (%)	Some of the time n (%)	Most of the time n (%)	All of the time n (%)
"How often do you decide what food and drinks are available in your home?"	4 (1.6)	37 (14.7)	84 (33.3)	127 (50.4)
"How often do you buy the food and drinks that are available in your home?"	2 (0.8)	41 (16.3)	83 (32.9)	126 (50.0)

Table 3. Characteristics of the Grocery Stores Where Survey Respondents Obtained Recipe Cards (n=252)[a]

Store Location	n (%)
Urban County	223 (88.5)
Rural/Frontier County	29 (11.5)
Travel Time from Home to Grocery Store	
15 minutes or less	175 (69.4)
16-45 minutes	60 (23.8)
46-60 minutes	7 (2.8)
More than 60 minutes	9 (3.6)
Usual Mode of Travel to Grocery Store	
Private vehicle	200 (79.4)
Walk or bike	25 (9.9)
Public transportation	16 (6.3)
Taxi	7 (2.8)
Other	3 (1.2)
Ride share	1 (0.4)

[a]Percents do not equal 100% due to refusals and/or missing responses.

Table 4. Reason(s) Endorsed by Survey Respondents for Taking a Recipe Card from the Grocery Store (n=252)

Reasons[a]	Affirmative n (%)
I like to try new recipes	119 (47.2)
The cards were free	116 (46.0)
I wanted to learn how to make healthy drinks	110 (43.7)
I like to make food and drinks at home	82 (32.5)
The display was attractive and clean	64 (25.4)
The poster got my attention	63 (25.0)
Other[b]	10 (4.0)

[a]Respondents were allowed to endorse more than one reason.
[b]Respondents were allowed to offer other reasons for taking a recipe card.

Table 5. Survey Respondents' Opinions of Specific Recipe Card Features (n=252)

Recipe Cards	Strongly Disagree n (%)	Disagree n (%)	Neither Agree or Disagree n (%)	Agree n (%)	Strongly Agree n (%)
"The instructions on the recipe card(s) are simple"	0 (0.0)	2 (0.8)	11 (4.4)	64 (25.4)	175 (69.4)
"The recipe(s) cost too much to make"	79 (31.3)	85 (33.7)	63 (25.0)	14 (5.6)	11 (4.4)
"The recipe(s) make healthy drinks more convenient"	1 (0.4)	6 (2.4)	46 (18.3)	109 (43.3)	90 (35.7)
"The recipe(s) call for foods and drinks that I usually buy"	4 (1.6)	18 (7.1)	50 (20.0)	93 (37.0)	87 (35.0)
"The recipe card(s) are missing important information"	84 (33.3)	103 (41.0)	34 (13.5)	17 (6.7)	14 (5.6)

Table 6. Perceived Benefits of Recipe Cards Among Survey Respondents (n=252)

Benefits of Cards	Strongly Disagree n (%)	Disagree n (%)	Neither Agree or Disagree n (%)	Agree n (%)	Strongly Agree n (%)
"I learned new ways to save money by making drinks at home"	3 (1.2)	22 (8.7)	76 (30.2)	83 (32.9)	68 (27.0)
"I learned how to make drinks that taste good"	0 (0.0)	8 (3.2)	40 (15.9)	123 (48.8)	81 (32.1)
"I have some new ideas for healthy drinks I can make at home"	2 (0.8)	10 (4.0)	30 (11.9)	129 (51.2)	81 (32.1)
"I have new information that will help me and/or my family healthy"	3 (1.2)	12 (4.8)	41 (16.3)	115 (45.6)	81 (32.1)
"I am more confident that I can make healthy drinks taste good"	1 (0.4)	7 (2.8)	37 (14.7)	118 (46.8)	89 (35.3)

Table 7. Behavior Changes and Intentions Affirmed by Survey Respondents (n=252)[a]

Behaviors and Intentions	Yes n (%)	Maybe n (%)	No n (%)
Prepared one or more of the drink recipes	227 (90.1)	N/A	25 (10.0)
Plan to prepare one or more of the drink recipes (n=25)[b]	15 (60.0)	7 (28.0)	3 (12.0)
Shared the recipe cards with others	149 (59.1)	N/A	103 (40.9)
Plan to share the recipe cards with others (n=103)[b]	39 (37.9)	46 (45.0)	18 (17.5)
Visited the RYD website	109 (43.3)	N/A	143 (56.7)
Plan to visit the RYD website (n=143)[b]	65 (45.5)	63 (44.1)	15 (10.5)
Other[c]	29 (11.5)	N/A	223 (88.5)

[a]Percents do not equal 100% due to missing responses.
[b] Includes only those respondents who answered "no" to the previous survey question.
[c]Respondents were allowed to describe what else they had done differently as a result of a recipe card.

Table 8. Exposure to RYD Elements as Reported by Survey Respondents

	Yes n (%)
"Do you remember seeing ads about healthy drink choices for kids on social media recently (for example, Facebook)?"	67 (26.6)
"Recently, has a physician or nurse talked to you or your child about healthy drink choices?"	61 (24.2)
"Do you remember seeing ads about healthy drink choices for kids on billboards recently?"	60 (23.8)
"Recently, has a dentist or dental hygienist talked to you or your child about healthy drink choices?"	38 (15.01)
"Do you recall receiving information about healthy drink choices in the mail in recent months?"	26 (10.3)

Figure 1

Photograph of one *Rethink Your Drink* Grocery Stand

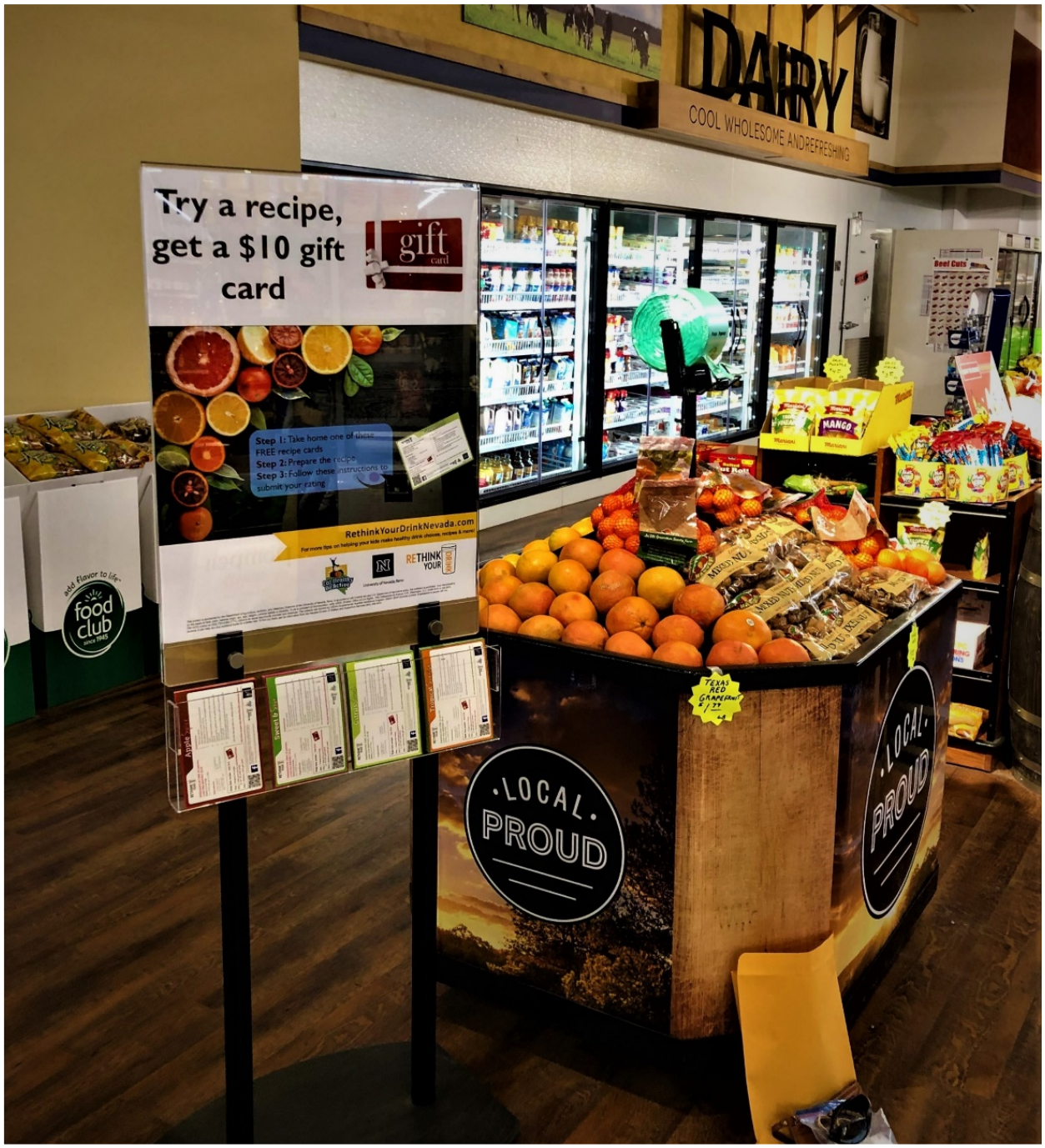


Figure 2

Rethink Your Drink Recipe Card in English

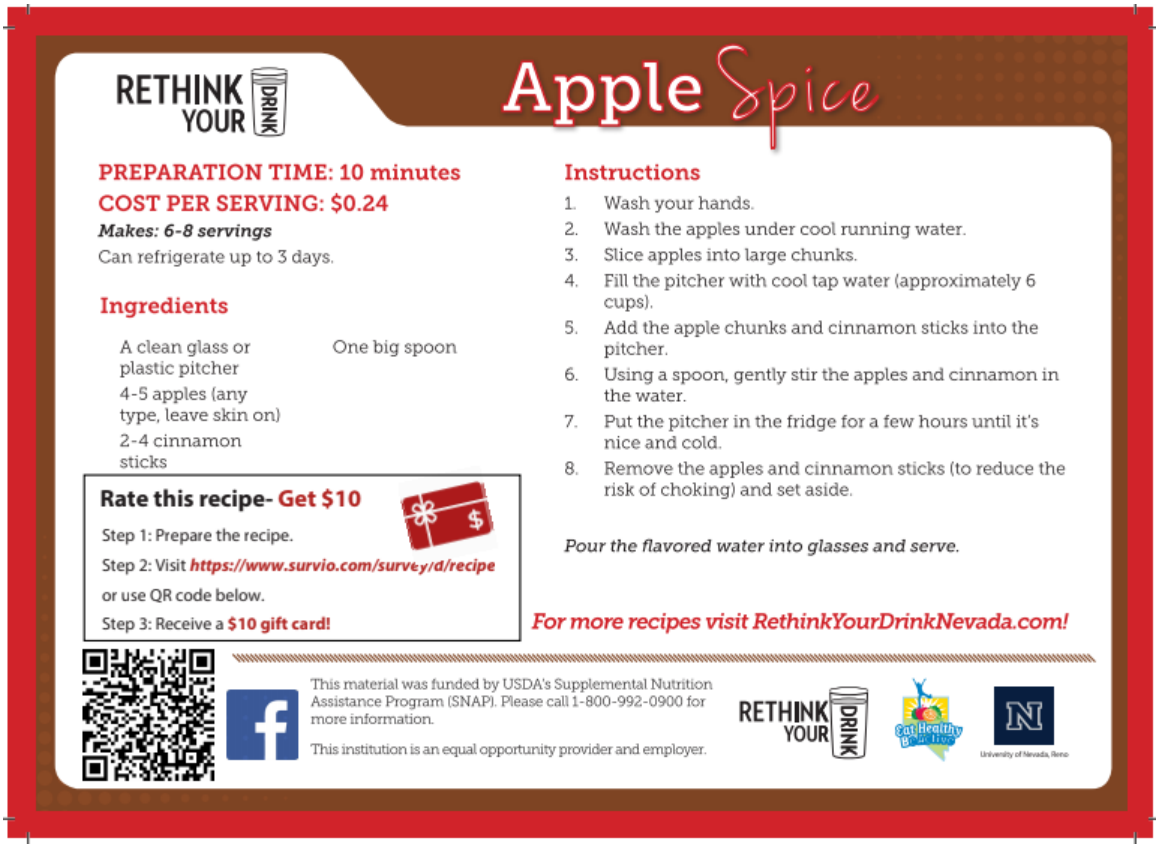
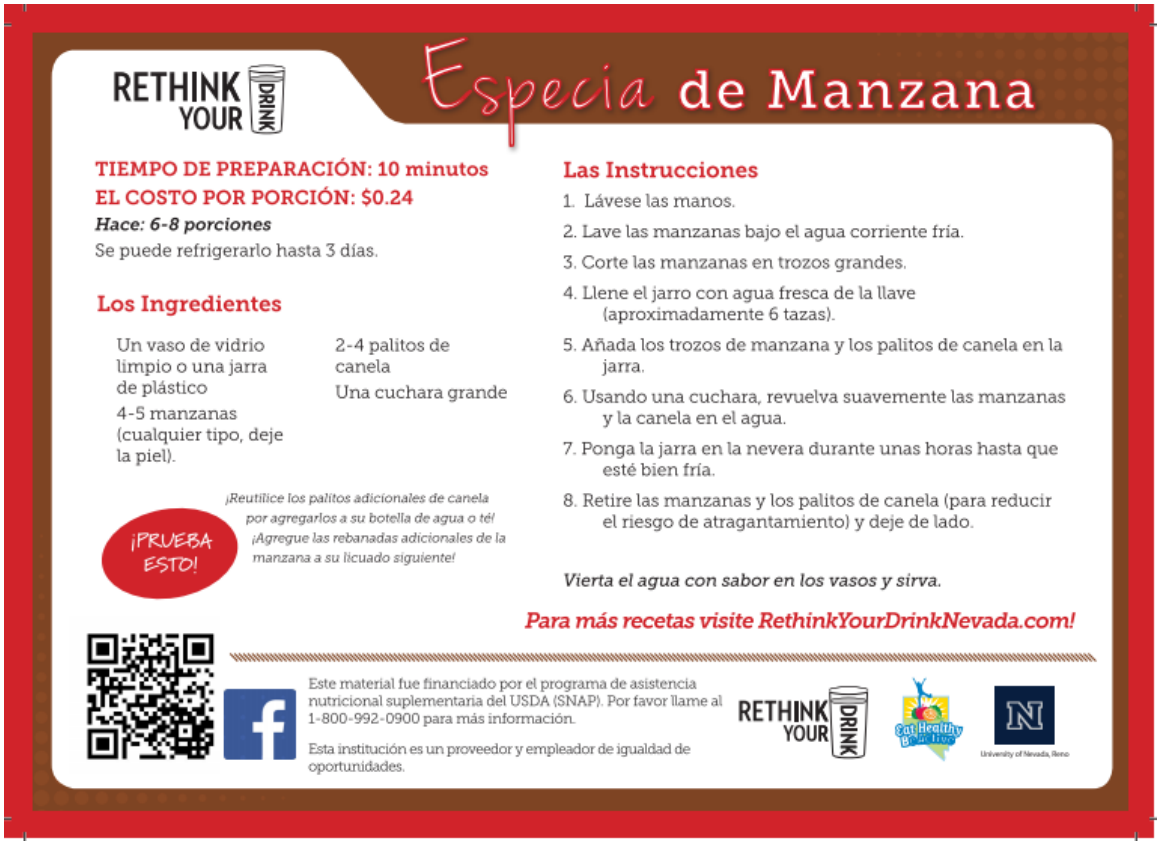


Figure 3

Rethink Your Drink Recipe Card in Spanish



Chapter 4

Conclusions

The purpose of this study was to examine consumers' use and perceptions of healthful beverage recipe cards distributed at 18 participating SNAP-authorized grocery stores in northern Nevada. The study represents one component of *Rethink Your Drink Nevada* (RYD), a community-based program led by Dr. Jamie Benedict. The goal of RYD is to promote healthful beverages choices and reduce SSB intake among children residing in low-income households. The primary target audience of RYD is households enrolled in SNAP, specifically parents/guardians of young school age children, 6-12 years old, in northern Nevada. To influence parents/guardians at the point-of-purchase, partnerships with SNAP-authorized grocery stores were initiated in 2017. Participating grocery stores provide space for the RYD recipe display stands used for the purpose of calling attention to and distributing free recipes for healthful beverages.

The objectives of this study were as follows:

1) To describe the sociodemographic characteristics of consumers who picked-up recipe cards from the grocery store RYD displays;

2) To describe consumers' perceptions of the grocery store where the RYD recipe cards for healthful beverages were distributed;

3) To determine factors that motivated consumers to take the recipe card(s), their opinions of specific features of the cards, and the extent to which they found the recipe cards to be of benefit; and

4) To assess what behaviors, if any, were modified as a result of recipe cards.

To achieve these objectives, a cross-sectional survey was conducted among a convenience sample of consumers at 18 RYD participating grocery stores. The online survey was conducted from September 2018 to January 2019. During the four-month study period, approximately 21,000 recipe cards were distributed among the participating grocery stores and 252 surveys were completed.

As described in Chapter 3, most survey respondents had taken recipe cards from stores in urban counties that were located 15 minutes or less from home. A very small percentage of respondents were participants in SNAP or WIC, but the majority lived in a household with children. The motivating reasons for taking a recipe card(s) reflect an interest in preparing healthful drinks at home and getting the cards for free. Respondents' opinions of specific features of the recipe cards, such as the instructions, convenience, and cost were overwhelmingly positive. The extent to which respondents perceived that that recipe cards were of personal benefit was also very positive. The specific benefits assessed here included saving money; learning how to make drinks that taste good; obtaining new ideas for healthy drinks to make at home and new information to help keep family members healthy; and gaining confidence in making healthy drinks that taste good. A large proportion of respondents had prepared the recipe and were very satisfied with the

results. In summary, the survey of consumers provides evidence that the recipe cards for healthful drinks at SNAP authorized grocery stores are an effective way to distribute information to consumers about healthful beverage options.

There are several important limitations to consider. The sample was one of convenience. Consumers of 18 participating grocery stores were invited to participate. The invitation was noted on the poster and recipe cards included in the RYD display. It is possible that this invitation drew the attention and interest of those who were dissimilar from others in ways that are unknown. In addition, the grocery stores were limited to a small number of SNAP authorized retailers in or near low-income communities in northern Nevada. Lastly, this study did not assess food purchases or dietary intake. Therefore, the extent to which the recipe cards resulted in the consumption of healthful beverages and/or a reduction of SSB is not known.

With these limitations in mind, further research is needed to determine the extent to which the distribution of free recipe cards for healthful beverages does improve dietary intake – specifically the intake of SSB. It would also be of benefit to learn if the findings here are similar to that of others. As RYD grows, there may be the possibility to do so. Future research is also needed to understand the perspective of consumers in low-income communities to encourage healthy purchases for the home. In addition, exploring the experiences of grocery store managers/owners who determine the food shopping environment for consumers would also be of benefit.

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Appendix A Rethink Your Drink Nevada Recipe Rating Survey

Rethink Your Drink Nevada Recipe Rating Survey

The purpose of this survey is to get your views about recipes that have been provided free-of-charge at select grocery stores throughout Northern Nevada. The survey should take about 5 minutes to complete. The information will help us improve the recipes for other customers in the future.

We know your time is valuable. As a way of saying thanks, we will send you a $10 e-gift card once we receive your survey. Please provide your email address at the very end of the survey. You will then receive an email from Tango Card with a link to redeem your $10 e-gift card. For accounting purposes only, your email address will be provided to the Controller's Office, at the University of Nevada, Reno. However, we will never ask for your name and your email address will not be shared with anyone else.

Your participation in this research study is completely voluntary. You may quit at any time by not submitting your survey to us.

We will keep all the completed surveys saved in a secure location for no more than five years after the study has ended. During that time, only study staff, members of the University of Nevada, Reno Social Behavioral Institutional Review Board, and representatives from our funding agency may see them. Once the surveys are no longer needed, the files will be destroyed.

If you have questions regarding the study please call Jamie Benedict or Deborah Joakimson at 775-784-6450 or send a note to rethinkyourdrink@cabnr.edu. There is an office that provides oversight called the Research Integrity Office. You may call them if you have any concerns on the conduct of the study at 775-327-2367.

If you wish to participate in the study, please click the button below to continue.

1. Are you over the age of 18?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No

Part I.

Please tell us about the grocery store where you found the recipe card(s). Mark the response that is true for you.

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1. In what city/town was the store located?

Question instructions: *Select one answer*

- ◯ Carson City
- ◯ Ely
- ◯ Eureka
- ◯ Gardnerville
- ◯ Reno or Sparks
- ◯ Winnemucca
- ◯ Zephyr Cove

2. Is this the store where you usually shop for groceries?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No

3. About how long does it take you to travel to this grocery store from your home?

Question instructions: *Select one answer*

- ◯ 15 minutes or less
- ◯ 16-45 minutes
- ◯ 46-60 minutes
- ◯ More than 60 minutes
- ◯ Don't know

4. How do you usually get to this grocery store?

Question instructions: *Select one answer*

- ○ Private vehicle
- ○ Public transportation
- ○ Taxi
- ○ Ride share
- ○ Walk or bike
- ○ Other (please list) _____

Part II.

This part of the survey is about what motivated you to take a free recipe card (or recipe cards) from the *Rethink Your Drink Nevada* display at the grocery store. Please mark all the reasons that describe why you took a recipe card(s).

5. Please mark all the reasons that describe why you took a recipe card(s).

Question instructions: *Select one or more answers*

- ☐ I wanted to learn how to make healthy drinks.
- ☐ The display was attractive and clean.
- ☐ I like to try new recipes.
- ☐ The cards were free.
- ☐ The poster got my attention.
- ☐ I like to make food and drinks at home
- ☐ Other reasons... _____

Part III.

Next, we would like to ask if you did anything differently as a result of reading the recipe card(s) or if you plan to do anything differently. Please mark the response that describes what is true for you.

6. Have you prepared one or more of the drink recipes?

Question instructions: *Select one answer*

- ○ Yes
- ○ No

7. If no, do you plan to prepare one or more of the drink recipes within the next few weeks?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No
- ◯ Maybe

8. On a scale of 1 to 5, how satisfied were you with the drink you prepared? (1=very dissatisfied and 5=very satisfied)

Question instructions: *Select one answer*

- ◯ 1 (very dissatisfied)
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5 (very satisfied)

9. On a scale of 1 to 5, how likely are you to make this drink again? (1=very unlikely and 5= very likely)

Question instructions: *Select one answer*

- ◯ 1 (very unlikely)
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5 (very likely)

10. Have you gone to the Rethink Your Drink Nevada website (rethinkyourdrinknevada.com)?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No

11. If no, do you plan to go to the Rethink Your Drink Nevada website in the new few weeks?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No
- ◯ Maybe - I haven't decided

12. Have you shared the recipe card(s) with others?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No

13. If no, do you plan to share the recipe cards with others?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No
- ◯ Maybe - I haven't decided

14. Was there anything else you did differently as a result of taking/reading the recipe card(s) that we didn't ask about?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No

15. Please tell us what you did differently:

Part IV.

This part of the survey is about your opinions of the *Rethink Your Drink Nevada*recipe card(s) and how they may have helped you. Please indicate how much you agree or disagree with each of the following statements.

16. The instructions on the recipe card(s) are simple.

Question instructions: *Select one answer*

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

17. The recipe(s) costs too much to make.

Question instructions: *Select one answer*

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

18. The recipe(s) make healthy drinks more convenient.

Question instructions: *Select one answer*

- ◯ Strongly agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

19. The recipe(s) call for foods and drinks that I usually buy.

Question instructions: *Select one answer*

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

20. The recipe card(s) are missing important information.

Question instructions: *Select one answer*

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

Just a reminder, the following questions are about how or if the Rethink Your Drink recipe cards helped you. Please indicate how much you agree or disagree with each of the following statements.

21. I learned new ways to save money by making drinks at home.

Question instructions: *Select one answer*

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

22. I learned how to make drinks that taste good.

Question instructions: *Select one answer*

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

23. I have some new ideas for healthy drinks I can make at home.

Question instructions: *Select one answer*

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

24. I have new information that will help keep me and/or my family healthy.

Question instructions: *Select one answer*

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

25. I am more confident that I can make healthy drinks that taste good.

Question instructions: *Select one answer*

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

Part V.

This part of the survey is about your opinions of the grocery store where you found the *Rethink Your Drink Nevada* recipe card(s). Please check the answer that best describes you.

26. The grocery store helps me stretch my food budget.

Question instructions: *Select one answer*

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

27. The grocery store stocks plenty of healthy food and drinks.

Question instructions: *Select one answer*

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

28. The grocery store offers good quality for the prices.

Question instructions: *Select one answer*

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

29. This grocery store supports efforts to improve the health of our community.

Question instructions: *Select one answer*

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither agree or disagree
- ◯ Disagree
- ◯ Strongly Disagree

Part VI.

We have a just a few more questions about other parts of the *Rethink Your Drink Nevada* program. Please check the answer that is true for you.

30. Do you recall receiving information about healthy drink choices in the mail in recent months?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No
- ◯ Don't know

31. Do you remember seeing ads about healthy drink choices for kids on social media recently (for example, Facebook)?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No
- ◯ Don't know

32. Do you remember seeing ads about healthy drink choices for kids on billboards recently?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No
- ◯ Don't know

33. Recently, has a dentist or dental hygienist talked to you or your child about healthy drink choices?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No
- ◯ Don't know

34. Recently, has a physician or nurse talked to you or your child about healthy drink choices?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No
- ◯ Don't know

Part VII.

This last part of the survey is about you. Please mark the response that is true for you.

35. What is your gender?

Question instructions: *Select one answer*

- ◯ Female
- ◯ Male
- ◯ Non-binary
- ◯ Prefer not to answer

36. What year were you born?

37. How many people (adults and children) live in your household?

38. Of all those in your household, how many are children (less than 19 years of age)?

39. What was the highest level of school you completed?

Question instructions: *Select one answer*

- ◯ 1st to 8th grade
- ◯ 9th to 11th grade
- ◯ High school diploma or a GED
- ◯ Some college
- ◯ Associates degree
- ◯ Baccalaureate degree
- ◯ Other (please specify): ☐
- ◯ Prefer not to answer

40. What race are you?

Question instructions: *(check all that apply to you)*

- ☐ American Indian/Alaskan Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or other Pacific Islander
- ☐ White
- ☐ Prefer not to answer

41. Are you Hispanic?

Question instructions: *Select one answer*

- ◯ I am Hispanic
- ◯ I am not Hispanic
- ◯ Prefer not to answer

42. How often do you decide what food and drinks are available in your home?

Question instructions: *Select one answer*

- ◯ All of the time
- ◯ Most of the time
- ◯ Some of the time
- ◯ None of the time

43. How often do you buy the food and drinks that are available in your home?

Question instructions: *Select one answer*

- ◯ All of the time
- ◯ Most of the time
- ◯ Some of the time
- ◯ None of the time

44. Do you currently participate in SNAP (the Supplemental Nutrition Assistance Program)?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No
- ◯ Prefer not to answer

45. Do you currently participate in WIC (the Special Supplemental Nutrition Program for Women, Infants, and Children)?

Question instructions: *Select one answer*

- ◯ Yes
- ◯ No
- ◯ Prefer not to answer

46. Thank you for answering our questions. Please provide your email address so that we can send you your $5 e-gift card.

Appendix B Script for Grocery Stores

Script for grocery stores:

Research team member: "Would you like a drink recipe from the UNR Nutrition Department?"

If customer shows interest:

Research team member: "We have several different drink recipes here (point to stand). Please feel free to take as many as you would like. I also wanted to mention that we are conducting a survey about our recipes. If you are interested, we would appreciate your opinions. The survey can be taken online in about five minutes. The instructions are right here on the card (point to the instructions). Everyone who completes a survey will receive a $10 gift card that can be used at Amazon or at stores like Target. I can answer any questions you have now or you can find our contact info on our website that is listed on the recipe card.

If customer asks about the gift card:

Research team member: "If you complete the survey online, a $10 gift card from Tango Card will be sent to your email. It can be used in-person or online at many stores."

Appendix C Institutional Review Board Approval

University of Nevada, Reno

Research Integrity
218 Ross Hall / 331,
Reno, Nevada 89557
775.327.2368 / 775.327.2369 fax
www.unr.edu/research-integrity

DATE:	September 10, 2018
TO:	Jamie Benedict, PhD, RD
FROM:	University of Nevada, Reno Institutional Review Board (IRB)
PROJECT TITLE:	[508842-22] "Rethink Your Drink": Development of a Social Marketing Campaign to Reduce Intake of Sugar-Sweetened Beverages among School-Age Children
REFERENCE #:	Social Behavioral; Children
SUBMISSION TYPE:	Amendment/Modification
ACTION:	APPROVED
APPROVAL DATE:	September 10, 2018
EXPIRATION DATE:	November 13, 2018
REVIEW TYPE:	Expedited Review
REVIEW CATEGORY:	Expedited review *#6 and 7*

The UNR IRB has reviewed and approved in the above-referenced protocol in accordance with the requirements of the Code of Federal Regulations on the Protection of Human Subjects (45 CFR 46 and 21 CFR 50 and 56). This approval is based on assessment that the research met all applicable regulatory criteria. The research must be conducted in accordance with this approved submission. This submission has received Expedited Review based on applicable federal regulations.

Please prepare a Continuing Review / Progress Report Request at least 4 weeks prior to the approval expiration date using IRBNet https://www.irbnet.org. IRBNet will send you a courtesy reminder to that effect. Unless updated, the IRB is only authorized to approve a study activity for 12 months or less. There is no grace period. The study will be closed on the above stated expiration date unless the IRB receives and approves your annual update.

Instructions for preparing a modification, continuing review, or status report are located at http://www.unr.edu/research-integrity/human-research/irbnet. Call our office if you have any questions or problems with use of IRBNet software.

Approved Documents

- Amendment/Modification - Amendment Request 9-7-2018.docx (UPDATED: 09/7/2018)conduct an online survey for the purpose of evaluating the Rethink Your Drink recipe cards
- Cover Sheet - Cover page 9-7-2018.docx (UPDATED: 09/7/2018)
- Other - Privacy Policy.docx (UPDATED: 09/7/2018)
- Other - Appendix B Recipe Card 2018.pdf (UPDATED: 09/7/2018)
- Other - Appendix A Grocery Store Poster 2018.pdf (UPDATED: 09/7/2018)
- Protocol - Protocol 9-7-2018.docx (UPDATED: 09/7/2018)
- Questionnaire/Survey - Appendix C Rethink Your Drink Nevada Recipe Rating Survey.pdf (UPDATED: 09/7/2018)

If you have any questions, please contact Nancy Moody at 775.327.2367 or at nmoody@unr.edu.

NOTE for VA Researchers: You are not approved to begin this research until you receive an approval letter from the VASNHCS Associate Chief of Staff for Research stating that your research has been approved by the Research and Development Committee.

Sincerely,

Richard Bjur

Richard Bjur, PhD
Co-Chair, UNR IRB
University of Nevada Reno

Janet Usinger, PhD
Co-Chair, UNR IRB
University of Nevada Reno

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Nevada, Reno IRB's record.