"Mentoring to be Active" for daily physical activity and the relationship with Sugar-Sweetened Beverage Consumption among Appalachian Middle School-Aged Students

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Abstract

- **Purpose and Background/Significance**: Sugar-sweetened beverages (SSB) are the major source of added dietary sugar in youth. Excessive SSB consumption is related to poorer health outcomes, such as obesity, diabetes, and heart disease. Youth residing in Rural Appalachia are the largest consumers of SSBs. Few interventions targeting SSBs in the region. Middle school aged youth are at a critical developmental period where they develop lifelong habits. The purpose of this descriptive/exploratory study is to examine the effects of *Mentoring to be Active* (MBA), on 7th grade students SSB consumption.
- **Conceptual framework**: The 8 session MBA was based on the Social-Cognitive Theory**.**
- **Method**: MBA paired 7th grade mentees with 10th grade mentors. Mentors taught healthy behaviors with an emphasis on physical activity at home and reducing sugar consumption. Mentees and mentors were recruited from two school districts. Mentees completed, a validated survey reporting SSB consumption “at school” and “not at school” during the past 7 days. Data were collected at baseline and at immediate post-test.
- **Results**: 52 middle-school students (Mean age = 12.79) participated. Sample was nearly equally female (51.9%) and male (48.1%). Ethnicity mirrored the geographical region as (86.5%) White and (13.5%) Native American. SSB consumption when “not at school” reduced by 4 ½ servings per a week. This reduction was due to the decreased consumption of orange juice and fruit drinks. This was encouraging due to “not at school” targeting self-management behavior. Sports drinks consumption increased, perhaps due to increased physical activity. Regular soda/pop consumption (at least one serving a day) increased to by 5%. Overall SSB consumption when “at school” increased across most beverages. Fruit drinks, sports drinks, and regular soda/pop increased.

- **Conclusions**: The results indicate a need for a targeted intervention on sugar consumption at home and at school. The increase in SSB consumption at school may be due to most students receiving free/reduced meals with limited choices or non-regulated availability to children while at school. Interventions targeting small lifestyle behaviors may lead to additional behavioral modifications, especially at home.
- **Notes**: I was Key Personnel. I participated in data collection and data entry. I created inspirational/educational messages and I prepared intervention materials/incentives. I helped to revise the layout of sugar consumption survey.

Chapter I

Introduction

Sugar-sweetened beverages (SSBs) are the major source of added sugar in the American diet and provide little nutritional value (Centers for Disease Control and Prevention, 2019). Excessive SSB consumption is related to obesity, diabetes, heart disease, poor dental health and other preventable diseases (Centers for Disease Control and Prevention, 2019). Adolescents are in a critical period of development and becoming more independent with more choices (Healthy People 2020, n.d.). “Most American children and adolescents consume excessive SSBs, and those living in rural, low-income house- holds consume disproportionate amounts” (Lane et al., 2018a, p. 1387). Reducing the consumption of calories from added sugars has been a focus of research and government programs but disparities persist. Especially, “among low-income households, SSB usual intake was highest among [Non- Hispanic White] NHW children” (Mendez, Miles, Poti, Sotres-Alvarez, & Pokin, 2019, p. 86). A large percentage of Appalachian adolescents reside in low-income households; not surprisingly, Appalachian adolescents consume three times the amount of SSB when compared to the national average of other adolescents' consumption (Lane et al., 2018a).

Appalachia is a rural and predominantly isolated region. Residents of Appalachia are predominately Caucasian. The region suffers from disparate rates of low-income households, unemployment, reduced educational prospects, and limited access to health care (Lane, Porter, Hecht, Harris & Zoellner, 2018). The isolated geographic location of Appalachia developed into a unique culture that values family, community, loyalty, independence, and hard work (Smith, Laurent, Baumker, & Petosa, 2018). Appalachian residents suffer from poorer health including the highest adolescent obesity incidence rates compared to other geographic, cultural, or income groups (Lane et al., 2018a).

Background

Reducing SSB consumption in adolescents has been a major focus of research for several years; several school and community-based interventions have been implemented. As a result, Mendez et al. (2019) found that SSB consumption has declined equivalently across ethnic groups. However, the heaviest consumers of SSBs consume 300Kcal/day or more from SSBs compared to 150kcal/day of the average consumption behaviors of most consumers. The type of SSB preferred and consumed varies by ethnic group. For example, soda consumption was greatest among Non-Hispanic whites and Mexican Americans. Non-Hispanic Blacks consumed the greatest amount of fruit drinks. These preferences and consumption behaviors signal the need for specialized programs tailored to meet the needs of each ethnic group (Mendez et al., 2019). Appalachia, the heaviest adolescent consumers of sugar-sweetened beverages, has had few studies or interventions targeting SSB behaviors.

Purpose of the study

The purpose of this correlational study is to explore the effects of a physical activity intervention targeting 7th grade students, “Mentoring to be Active,” on other health behaviors including sugared-sweetened beverage consumption. This study is a secondary analysis of a subset of data from a feasibility study. SSB consumption while “at school” and “not at school” was explored. Baseline and follow up data are included.

Significance of the study

The secondary analysis will explore how the adapted “Mentoring to be Active” , a physical activity intervention, also affected SSB consumption in Appalachian middle schoolers, children with a unique cultural identity. The intervention is one of the few tailored studies to address middle school aged children while tailoring for the Appalachian culture and unique environmental needs.

Conceptual Framework

“Mentoring to be Active” intervention incorporates concepts based on the Social Cognitive Theory. Content included strategies to improve self-regulation skills, social support, physical activity self-efficacy, and goal setting for physical activity during discretionary time. Content also included strategies to increase water consumption and decrease SSB consumption.

Research Questions

1. Do the preferred SSBs of rural Appalachian middle school-aged children change from baseline to follow up?
2. Does SSB consumption when “not at school” change from baseline to follow up?
3. Does SSB consumption when “at school” change from baseline to follow up?
4. Do overall daily servings of SSBs change from baseline to follow up?

Limitations

This study was a feasibility study to test the efficacy, validity and reliability of an adapted MBA intervention using adapted measures. These adapted measures used may not be reliable and or valid for the middle school-aged students. The study included no blinding or randomization. The questionnaire relied on self-report of behaviors. The answers provided by the students may be subject to social desirability bias. The questionnaire was written at a 3rd grade reading level, but some students may not have read at that level. In answering all items, students may have had some degree of fatigue. The purpose of the feasibility study was to refine the measures for a larger follow up study. Given that this was a feasibility study, only two schools with 52 students participated.

Chapter II: Literature Review

A review of the literature was conducted between January and June of 2019. The search targeted the consumption of sugar-sweetened beverages and water in adolescents and interventions focused on reducing SSBs in adolescent populations. Key search terms used were sugar-sweetened beverages, adolescents, rural, consumption, and synonyms of terms. Exclusion terms included: urban, metropolitan, infants, preschoolers, water supply, and tax. Articles were selected from the following academic databases: CINHAL, PubMed, and MEDLINE. The search was limited to peer-reviewed articles, articles published within the past 5 years, and written in the English language. The literature review included the social, community, environmental, and biological factors that influence SSB consumption. The goal of this literature review was to understand the current body of evidence on SSB/water consumption and interventions in adolescence with an emphasis on rural populations.

Social Influences

Evidence suggests that parents are the most influential factor in forming their children's SSB behaviors in early childhood. Parents model beverage consumption for their children and determine what beverages are available in their households (SanGiovanni, Fallar, Green, & Mogilner, 2018). Parental habits and authority influence how children and adolescents perceive and understand SSBs (Battram et al., 2016). Knowledge about dietary guidelines may influence parent actions regarding child SSBs. Parents who were knowledgeable about healthy beverage guidelines had children with lower SSB consumption (SanGiovanni et al., 2018).

Adolescents are more influenced by peers and peer pressure; they seek acceptance and want to "fit in" with their friends. Peers may introduce them to new beverages and have influence on social norms of preferred beverages (Battram et al., 2016). Moreover, Lebel et al. (2016) found that adolescents that moved from a school with low SSB consumption to a school with higher SSB consumption increased their own daily SSB consumption. Because of the powerful impact of peers on behaviors, peer relationships have been utilized to reduce SSB consumption among adolescents. Literature demonstrated that peer teaching and peer led interventions are effective in teaching and reducing SSB consumption (Smith, 2014). However, there are few interventions that utilize peer teaching for SSB interventions.

Most current SSB interventions are led by school educators and integrated into the classroom setting. Teachers and school staff are seen as authority figures by students in schools. Staff led wellness councils can be effective in reducing SSB consumption (Tipton, 2016). Additionally, school nurses are sources of nutritional and wellness knowledge; school nurses are at the forefront of programming and are well placed to initiate SSB policies and programs (Tipton, 2016). However, staff support is necessary to implement interventions or enforce policies targeting SSB consumption (Elbel et al., 2015; Lawman et al., 2019).

Battram et al., (2016) found that the type of beverage consumed was an individual choice. Adolescents based their choices mainly on personal preference and availability. Adolescents seem to be aware that consuming beverages with high sugar content can have negative health implications. They were also aware of the positive health benefits of water and milk. Despite this knowledge, adolescents still said that preference was the deciding factor for beverage choice (Battram et al., 2016).

Community Influences

Mounting evidence indicates that SSB habits and preferences vary based on one's community. All communities have unique, cultural, geographic, ethnic, socioeconomic influences, and health-related needs. Evidence suggests that programs and interventions need be tailored to the specific geographical regions (Mendez et al., 2019). Further, a lack of community support for programs or personnel can be a barrier to implementing successful interventions targeting SSB behaviors as well as policy development (Mansoor, Ali, & Richards, 2017). Geographical areas with a high percentage of residents in low socioeconomic status is associated with higher SSB beverage consumption among residents (Mendez et al., 2019). Other demographic factors related to SSB consumption include ethnicity. For example, non-Hispanic whites generally have the highest SSB consumption rates in low-income households (Mendez et al., 2019). The perceived high cost of healthier alternatives to SSBs can be a significant barrier to reducing SSB consumption (Terry et al., 2016). Additionally, urban living and rural living has a strong relationship to SSB consumption. Urban adolescents may have higher SSB consumption rates compared to rural adolescents (Lebel et al., 2016). However, few studies have targeted rural adolescents; interventions targeting SSBs have not been adapted to rural settings.

Appalachian adolescents live in community with a unique combination of poverty, rural area, and cultural factors. More than half of the adolescents qualify for price reduced or free federal funded lunches. Due to the isolation and pervasive poverty, Appalachians value their community, self-reliance, hard-work, and loyalty. The community has had disproportionate amount of poor dental health, obesity, and comorbidities. These poorer health outcomes, especially obesity, can be attributed to the excess consumption of calories from added sugars. For example, in Appalachia the cultural norm is to sip sugar-sweetened carbonated beverages all day long. (Smith et al., 2018). Appalachian adolescents consume 3 times the nation average of SSBs and suffer from some of the highest rates of childhood obesity (Lane et al., 2018a). However, few health behavioral interventions targeting SSB and water consumption address the unique culture and prevalent health disparities in Appalachian youth (Lane et al., 2018a).

Environmental Influences

Media and advertisements influence beverage choice. Celebrity endorsements and appealing slogans are often the reasons why adolescents try new beverages including SSBs and healthier beverage choices (Battram et al., 2016). Considering the powerful influence of the media, it could be a useful tool to promote healthier beverage choices (Battram et al., 2016). Healthier beverage alternatives needed to be made more appealing for students (Tipton, 2016). Additionally, policies that limit the marketing of SBBs and those that promote health literacy regarding SSBs are effective tools to reducing SSB consumption (Tipton, 2016; Lane et al., 2018). Nevertheless, the media’s influence on beverage behaviors may be short-term and temporary (Battram et al., 2016). Personal preferences often influenced by family and peers outweigh the appeal of new advertised SSBs or other beverage choices.

Availability and price of beverages also were environmental factors related to SSB and water consumption. Policies that limit the sale of SSBs or the sugar content of SSBs at schools have been successful in reducing SSB consumption (Tipton, 2016; Smith et al., 2014). However, healthier alternatives available at school are often unappealing to adolescents (Tipton, 2016). For example, water fountains that are old, out of the way, lack of water pressure, provide warm water and/or water with an aftertaste are not acceptable alternatives. Additionally, concerns about water safety such as potential contaminates is a concern to many adolescents and families. These factors are barriers that prevent adolescents from drinking from water fountains (Lawman et al., 2019). Potential solutions include periodic water testing, hydration stations with bottle fillers, and water jet instillations (Elbel et al., 2015; Lawman et al., 2019). Finally, the price of purchased beverages limit what adolescents can consume, especially in economically poorer communities such a rural Appalachia. With this in mind, price control through taxation maybe a tool to reduce SSB consumption, especially among low-income communities. However, taxing the poor may be a controversial issue because of the disparate burden placed on the poor drinking SSBs.

Biological Influences

Older adolescents consume more SSBs and less water than their younger counterparts (Lebel et al., 2016; Mendez et al., 2019). Appalachian adolescents engage in these unhealthy behaviors at younger ages (Smith et al., 2018). Consequently, targeting younger adolescents for interventions aimed at reducing SSBs has been most successful. When compared to younger adolescents, older teens demonstrated no improvement or less improvement in reducing SSBs than younger adolescents (Delpier, Giordana, & Wedin, 2013).

The sex of adolescents might have an influence on SSB consumption. However, the literature is not conclusive, as the body of evidence does not agree on which sex consumes more. Several studies show that boys consume more total quantity of SSBs than girls (De cock et al., 2016; Tipton, 2016; Smith et al., 2018). Other studies report that girls report a higher sensitivity to reward and, while drinking smaller amounts, have a higher frequency of consuming SSBs and high fat foods (De cock et al., 2016; Smith et al., 2018). Other studies found no correlation between gender and SSB consumption (Lebel et al., 2016). Girls and boys may have had different motivations for consuming SSBs (De cock et al., 2016). The differences in results might be due to study size or community differences. Larger studies with large population variety have more generalizable results but may not be effective for smaller communities with unique cultural needs. The results of smaller study can reflect the cultural norms of a single community more that larger studies that encompass several communities. Additionally, older studies did not have the most accurate measures or tools therefore the results could be imprecise.

Race/ethnicity alone did not have any significant association with SSB consumption. However, race combined with socioeconomic status showed a various SBB consumption by group. Non- Hispanic black adolescents had the highest consumption among high-income households. Non-Hispanic white adolescents had the highest consumption among the low-income households (Mendez et al., 2019). Appalachian community has had both wide-spread poverty and the majority of the population are white (Smith et al., 2018). However, there are few SSB interventions targeting the Appalachian community.

Behavioral Influences

Small and manageable healthy behavioral changes are coupled with other healthy lifestyle behaviors (Smith et al., 2014). For example, physical activity behaviors have been connected to SSB behaviors. Physical Activity has been shown to have a negative relationship with SSB consumption (Vanderlee, 2014). For example, higher physical activity rates were associated with decreased SSB consumption (Vanderlee, 2014). Further, higher sedentary activities were related to increased SSB consumption (Smith, 2019). Finally, decreased SSB consumption rates are related to increased water consumption among adolescents (Smith et al., 2014; Terry et al., 2016)

Summary

Adolescents from low-socioeconomic white communities, such as Appalachia, are one the highest consumers of SSBs. Other Healthy behaviors such as a regular physical activity and water consumption may help to decrease SSB consumption in rural Appalachia. Adolescent SSB consumption behaviors are influenced by several factors: social, community, environmental, as well as biological, and personal behaviors. The complexity and multi-levels of influence on SSB behaviors impact an intervention's success at reducing SSB consumption. Social influences include a combination of personal preferences coupled with parental, peer, and educator influences. In school interventions allow for the utilization of peer teaching. This makes schools ideal settings for interventions because schools are the primary social setting influencing most adolescents. Teens spend the majoring of their waking hours at school. Every school and the larger communities have unique cultural identities and needs that have to be accounted for when tailoring health interventions.

Rural Appalachian communities experience pervasive health disparities including high rates SSB consumption, lower water consumption and associated poorer health outcomes including obesity and comorbidities. In addition, Appalachians have unique cultural norms and values; few interventions are tailored to meet their specific needs. Broader factors such as the media and policies can be used as a tools to promote healthier behaviors such as drinking more water and discourage unhealthy SSB consumption. SSB availability influences consumption habits; adolescents purchase what is affordable and readily available. It is necessary to make healthier beverage alternatives more appealing to adolescents. However, few SSB interventions are tailored to the Appalachian schools with high levels of free or subsidized meals.

Older adolescents have unhealthier beverage behaviors and more difficulty changing their behaviors for the longer term. Gender plays a role how adolescents think about SSBs and needed to be considered when designing and delivering interventions.

Chapter III: Methodology

Introduction of Parent Study

The secondary analysis for this exploratory study is from a feasibility study led by Drs. Laureen Smith and Rick Petosa. The parent study was a quantitative pre-test/post-test design to test preliminary feasibility of "*Mentoring to be Active,"* a peer-mentoring health behavior improvement intervention, to target middle school students within rural Appalachia, an area with few resources. This study was funded by the Rita and Alex Hillman Foundation. The Ohio State University Social and Behavioral Science Human Subjects Review Committee approved the study (Protocol # 2018B094).

Participants

The parent study recruited 52 seventh graders as mentees from two rural Appalachian middle schools. The inclusion criteria, for mentees, was being enrolled in the 7th grade and the exclusion criteria was participation in organized sports.

In addition, 22 10th grade students from two local high schools were recruited to serve as peer mentors. The goal was for was for each mentor to have no more than 2 mentees. The mentors were recruited and selected based on applications, screening for interest/ability to support peers and attitude to improving healthy behaviors. Inclusion criteria for high school mentors was attending the same school system as the mentees and living within the same community.

Both mentors and mentees were provided incentives for participation. Mentees were given $15 at each of the three data collections, when they returned their accelerometers, for a total $45. Mentors were given $20 for completing mentor training and $10 for each of the 10 mentor-mentee sessions for a total of $120.

Procedures

Mentors were required to participate in a 6-hour training program to prepare them for administering the intervention and the responsibilities of being a peer mentor. The training taught mentors to be encouraging and support their mentees through the program. All mentee participants received the intervention. The mentees completed 8 sessions, one session per week, targeting heathy behaviors with an emphasis on SSB and physical activity. There were 12 weeks allotted for the intervention to allow for weather related school closures. Each week peer-mentors met with their mentees to complete a lesson and workbook. The intervention was administered at school and during school hours.

Measures

Sugared Sweetened Beverages

Sugar-sweetened beverages (SSB) were defined as 100% juices, fruit drinks, sports drinks without caffeine, flavored water without caffeine, regular soda/pop, energy drinks with caffeine, and flavored milk. One serving of SSBs was defined as eight ounces or one cup. One water serving was defined as eight ounces or one cup. Mentees completed surveys for SSBs consumed “at school” and “not at school.” Each item ranged from “never,” “occasional” (less than one SSB per a day), and “frequent” (more than one SBB per day). SSBs were defined as “preferred” if the child reported consuming at least one serving per day.

Setting

This study was conducted in two rural Appalachians schools in southern Ohio. Over 75% of the students received free or reduced-price breakfast and lunch. Two middle schools and two high schools from different school districts participated. For each pair of schools, the high school and middle school were housed within one building.

Data Procedures and Analysis

For the parent study, data were collected three times at the participating schools: pre-test data (T1), post-test data (T2), and final data collections (T3). Pre-test data was collected before the interventions to set a baseline. Post-test data was collected after the 10-week intervention to gauge effectiveness of intervention. Final data collection was collected at the beginning of the next school year to gauge long-term effectiveness of intervention. For this secondary analysis, only T1 and T2 data were included.

After collection, data were immediately transported to research project office. Data were stored within the locked office and on a secure server within the project office. Identifying data were removed and stored separately from the rest of the data. The data were entered into Microsoft Excel then analyzed using SPSS software (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). Descriptive statistics including mean, median, mode, standard deviation, range, minimum, and maximum were calculated.

Chapter IV: Research Results

Response Rate

There were 82 seventh grade students between the two school districts that were eligible to participate as mentees. Of the 82 seventh graders, 52 (63.4%) students participated in the study. On follow up, 40 (77%) of student mentees completed follow up data collection.

Profile of Sample/Population

Sample demographics of the 52 enrolled seventh graders included an equal distribution of sex, with 25 (58.1%) male and 27(51.9%) female students. The average age of mentees was 12.79 years old. The distribution of race among mentees mirrors the geographic community being primarily White with 52 (86.5%) White, 7 (13.5%) and Native American.

Do preferred SSBs of rural Appalachian middle school-aged children change from baseline and follow up?

"Not at School"

At baseline, the most preferred SSB was regular soda/pop (43.1%). The most preferred was followed by fruit drinks (32.0%), sports drinks (29.3%), flavored milk (22.0%), and orange juice (20.0%) as preferred SSB. At follow up, regular soda/pop (48.4%) remained the preferred SSB. Regular soda/pop was followed up by sports drinks, flavored milk, fruit drinks, and orange juice as most preferred drink.

"*At School"*

At baseline, students preferred flavored milk (40.0%). The preferred SSB after flavored milk were regular soda/pop (19.6%), fruit drinks (16.0%), sports drinks (12.0%), and orange juice (11.8%). At follow up, student preference was split with regular soda/pop (38.7%), flavored milk (36.7%), and fruit drinks (35.5%). The least preferred were sport drinks (19.4%) and orange juice (09.7%).

Does SSB consumption when "not at school" change from baseline to follow up, measured as never, occasional (<1 day), frequent (≥1 day) consumers?

There was an increase in regular soda/pop and sports drinks consumers among students from baseline to follow up. In regular soda/pop, the was an increase in frequent consumers but reduction in occasional and never consumers. In sports drinks, there was an increase in both frequent and occasional consumers. Flavored milk consumption increased extremes with more frequent and never consumers but a reduction of occasional consumers. Orange juice and fruit drinks had an overall reduction in consumers. Orange juice had a reduction in both frequent consumers and occasional consumers and an increase participant reporting never consuming orange juice. Fruit drink consumption was reduced in frequent occasional consumers, and an increase of participants reported never consuming fruit drinks.

Does SSB consumption when "at school" change from baseline to follow up, measured as never, occasional (<1 day), frequent (≥1 day) consumers?

When "at school," there was an increase in regular soda/pop and fruit drinks despite regular soda/pop not being sold by the cafeteria. Both SSBs had an increase in frequent consumers and a reduction in occasional and never consumers in students. Among orange juice, sports drink, and flavored milk consumers, there was an increase in occasional consumers but a reduction in both frequent and never consumers.

Do daily servings of SSBs change from baseline to follow up?

Males drank 5.5 more servings of SSB at baseline and reduced SSB consumption by 9.3 servings per a week by follow up. Females added sugar consumption was more from sugary snacks instead of SSB. When "not at school," there was an overall reduction of 4.5 servings of SSBs per week. This was due to a reduction in both orange juice and fruit drink consumption among students. Fruit drinks had the greatest decline, with 60% of students reporting never consuming fruit drinks during the day. However, there was an increase in sports drinks and regular soda/pop consumption. The greatest consumption being regular soda/pop with 48.4% of students reporting consuming more than one serving a day. When “at school,” there was an overall increase in the consumption of SSBs servings.

Sugar Sweetened Beverage Consumption *“Not At School”*

Beverage	Baseline		Initial Follow up		Final Follow Up		Changes in Servings	
Orange Juice	Never	38.0%	Never	33.3%	Never	51.6%	Never	+13.6%
	< 1 Per Day	42.0%	< 1 Per Day	35.9%	< 1 Per Day	32.2%	< 1 Per Day	-19.8%
	≥ 1 Per Day	20.0%	≥ 1 Per Day	15.4%	≥ 1 Per Day	15.9%	≥ 1 Per Day	-4.1%
Fruit Drinks	Never	38.0%	Never	31.6%	Never	60.0%	Never	+22.0%
	< 1 Per Day	30.0%	< 1 Per Day	23.7%	< 1 Per Day	20.0%	< 1 Per Day	-10.0%
	≥ 1 Per Day	32.0%	≥ 1 Per Day	21.1%	≥ 1 Per Day	19.9%	≥ 1 Per Day	-12.1%
Sports Drinks	Never	37.3%	Never	30.8%	Never	30.0%	Never	-7.3%
	< 1 Per Day	33.3%	< 1 Per Day	43.6%	< 1 Per Day	40.0%	< 1 Per Day	+6.7%
	≥ 1 Per Day	29.3%	≥ 1 Per Day	18.3%	≥ 1 Per Day	30.0%	≥ 1 Per Day	+0.7%
Regular Soda/Pop	Never	29.4%	Never	17.9%	Never	25.8%	Never	-3.6%
	< 1 Per Day	27.4%	< 1 Per Day	56.4%	< 1 Per Day	25.8%	< 1 Per Day	-1.6%
	≥ 1 Per Day	43.1%	≥ 1 Per Day	25.7%	≥ 1 Per Day	48.4%	≥ 1 Per Day	+5.1%
Flavored Milk	Never	48.0%	Never	48.7%	Never	48.4%	Never	+0.4%
	< 1 Per Day	30.0%	< 1 Per Day	20.0%	< 1 Per Day	25.8%	< 1 Per Day	-4.2%
	≥ 1 Per Day	22.0%	≥ 1 Per Day	25.6%	≥ 1 Per Day	25.9%	≥ 1 Per Day	+3.9%

Sugar Sweetened Beverage Consumption *"At School"*								
Beverage	**Baseline**		**Initial Follow up**		**Final Follow Up**		**Changes in Servings**	
Orange Juice	Never	47.1%	Never	45.0%	Never	45.2%	Never	-1.9%
	< 1 Per Day	41.2%	< 1 Per Day	35.0%	< 1 Per Day	45.1%	< 1 Per Day	+3.9%
	≥ 1 Per Day	11.8%	≥ 1 Per Day	20.0%	≥ 1 Per Day	09.7%	≥ 1 Per Day	-2.1%
Fruit Drinks	Never	48.0%	Never	56.4%	Never	38.7%	Never	-9.3%
	< 1 Per Day	36.0%	< 1 Per Day	28.2%	< 1 Per Day	25.8%	< 1 Per Day	-10.2%
	≥ 1 Per Day	16.0%	≥ 1 Per Day	15.4%	≥ 1 Per Day	35.5%	≥ 1 Per Day	+19.5%
Sports Drinks	Never	68.0%	Never	55.3%	Never	51.5%	Never	-16.5%
	< 1 Per Day	15.7%	< 1 Per Day	31.6%	< 1 Per Day	29.1%	< 1 Per Day	+13.4%
	≥ 1 Per Day	12.0%	≥ 1 Per Day	13.2%	≥ 1 Per Day	19.4%	≥ 1 Per Day	+7.4%
Regular Soda/Pop	Never	64.7%	Never	53.8%	Never	32.3%	Never	-32.4%
	< 1 Per Day	27.4%	< 1 Per Day	35.9%	< 1 Per Day	25.8%	< 1 Per Day	-1.6%
	≥ 1 Per Day	19.6%	≥ 1 Per Day	10.3%	≥ 1 Per Day	38.7%	≥ 1 Per Day	+19.1%
Flavored Milk	Never	40.0%	Never	35.0%	Never	20.0%	Never	-16.5%
	< 1 Per Day	20.0%	< 1 Per Day	32.5%	< 1 Per Day	43.4%	< 1 Per Day	13.4%
	≥ 1 Per Day	40.0%	≥ 1 Per Day	32.5%	≥ 1 Per Day	36.7%	≥ 1 Per Day	+7.4%

Chapter V: Conclusions and Recommendation

Summary & Conclusion

When "not at school," the MBA intervention resulted in decreased SSB consumption by 4.5 servings per a week. This is encouraging because this shows improvement of healthy behaviors during self-regulated time. This study found that most preferred SSB was regular soda/pop (43.1%-48.4%) and the least preferred SSB was orange juice (20.0% - 15.9%) at both baseline and final follow up. The results showed increased consumption of regular soda/pop and sports drinks. The most preferred beverage consumption only grew. The growth of sport drink consumption may be due to increased exercise as part of the intervention. Orange juice and fruit drinks, the least preferred SSBs, had reduced consumption.

When “at school,” the SSB consumption increased overall. This may be do the fact that most students enrolled in the program received free or reduced meals. These meals have limited beverage options for students. Students did try to vary their drink choices. The initially preferred SSB flavored milk changed to a split between flavored milk, regular soda/pop, and fruit drinks by final follow up.

Overall, the student preferred regular soda/pop as evidenced by the 40% or more of students that consumed one serving or more daily, both “at school” and “at home.” Despite school policies to regulate regular soda/pop. Most students reduced their consumption of orange juice to once a week or less. Male students started with higher levels of than consumption female students. The boys/males reduced SSB consumption far more than female students. Girls reduced sugary snacks instead of SSBs. Boys reduced their SSB consumption by more than 9.3 servings a week.

Implications of Study

This study suggests that the increase in other healthy behaviors does not necessarily mean a decrease in SSB consumption. Appalachian adolescent boys consume more SSBs than girls. Adolescents reduced their largest source of SSBs. The results implicate that healthy behavior interventions are most effective in reducing the student's least preferred beverages and it is more difficult to modify preferred drinking habits.

Recommendations

The results show that there is a need for an intervention to improve healthy dietary habits, both at school and at home. For further interventions, there should emphasize water consumption and include a post intervention interview to discover sources of regulated SSBs.

References

Centers for Disease Control and Prevention. (2019). Sugar Sweetened Beverage Intake. [online] Available at: https://www.cdc.gov/nutrition/data-statistics/sugar-sweetened-beverages-intake.html.

Battram, D. S., Piché, L., Beynon, C., Kurtz, J., & He, M. (2016). Sugar-Sweetened Beverages: Children's Perceptions, Factors of Influence, and Suggestions for Reducing Intake. *Journal of Nutrition Education & Behavior*, *48*(1), 27–34.e1. https://doi.org/10.1016/j.jneb.2015.08.015

De Cock, N., Van Lippevelde, W., Vervoort, L., Vangeel, J., Maes, L., Eggermont, S., … Van Camp, J. (2016). Sensitivity to reward is associated with snack and sugar-sweetened beverage consumption in adolescents. *European Journal Of Nutrition*, *55*(4), 1623–1632. https://doi.org/10.1007/s00394-015-0981-3

Delpier, T., Giordana, S., & Wedin, B. M. (2013). Decreasing Sugar-Sweetened Beverage Consumption in the Rural Adolescent Population. *Journal of Pediatric Healthcare*, *27*(6), 470–478. https://doi.org/10.1016/j.pedhc.2012.07.002

Elbel, B., Mijanovich, T., Abrams, C., Cantor, J., Dunn, L., Nonas, C., … Sohyun Park. (2015). A Water Availability Intervention in New York City Public Schools: Influence on Youths' Water and Milk Behaviors. American Journal of Public Health, 105(2), 365–372. https://doi.org /10.2105/AJPH.2014.302221

Grummon, A. H., Sokol, R. L., Hecht, C. A., & Patel, A. I. (2018). Measuring beverage consumption in US children and adolescents: a systematic review. Obesity Reviews: An Official Journal Of The International Association For The Study Of Obesity, 19(8), 1017–1027. https://doi.org/10.1111/obr.12692

Healthy People 2020. (n.d.). Nutrition and Weight Status. Retrieved from https://www.healthypeople.gov/2020/topics-objectives/topic/nutrition-and-weight-status/objectives

Lane, H., Porter, K. J., Hecht, E., Harris, P., Kraak, V., & Zoellner, J. (2018). Kids SIP smartER: A Feasibility Study to Reduce Sugar-Sweetened Beverage Consumption Among Middle School Youth in Central Appalachia. *American Journal of Health Promotion*, *32*(6), 1386–1401. https://doi.org/10.1177/0890117117715052

Lane, H. G., Porter, K. J., Hecht, E., Harris, P., & Zoellner, J. M. (2018). A Participatory Process to Engage Appalachian Youth in Reducing Sugar-Sweetened Beverage Consumption. *Health Promotion Practice*, 1524839918762123. https://doi.org/10.1177/1524839918762123

Lawman, H. G., Lofton, X., Grossman, S., Root, M., Perez, M., Tasian, G., & Patel, A. (2019). A randomized trial of a multi-level intervention to increase water access and appeal in community recreation centers. Contemporary Clinical Trials, 79, 14–20. https://doi.org/10.1016/j.cct.2019.02.003

Lebel, A., Morin, P., Robitaille, É., Lalonde, B., Florina Fratu, R., & Bisset, S. (2016). Sugar Sweetened Beverage Consumption among Primary School Students: Influence of the Schools' Vicinity. *Journal Of Environmental And Public Health*, *2016*, 1416384. Retrieved from http://proxy.lib.ohio-state.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=cmedm&AN=27752265&site=ehost-live

Mansoor, O. D., Ali, R., & Richards, R. (2017). Regional survey supports national initiative for "water-only" schools in New Zealand. *Australian & New Zealand Journal of Public Health*, *41*(5), 508–511. https://doi.org/10.1111/1753-6405.12705

Mendez, M. A., Miles, D. R., Poti, J. M., Sotres-Alvarez, D., & Popkin, B. M. (2019). Persistent disparities over time in the distribution of sugar-sweetened beverage intake among children in the United States. *The American Journal Of Clinical Nutrition*, *109*(1), 79–89. https://doi.org/10.1093/ajcn/nqy123

SanGiovanni, C., Fallar, R., Green, R., & Mogilner, L. (2018). Parental Knowledge of AAP Juice Guidelines Is Associated With Parent and Children's Consumption of Juice and Sugar-Sweetened Beverages in an Underserved Population. Clinical Pediatrics, 57(2), 205–211. https://doi.org/10.1177/0009922817696466

Smith, L. H., & Holloman, C. (2014). Piloting "Sodabriety": A School-Based Intervention to Impact Sugar-Sweetened Beverage Consumption in Rural Appalachian High Schools. *Journal of School Health*, *84*(3), 177–184. https://doi.org/10.1111/josh.12134

Smith, L. H., Laurent, D., Baumker, E., & Petosa, R. L. (2018). Rates of Obesity and Obesogenic Behaviors of Rural Appalachian Adolescents: How Do They Compare to Other Adolescents or Recommendations? *Journal Of Physical Activity & Health*, *15*(11), 874–881. https://doi.org/10.1123/jpah.2017-0602

Smith, L. H., Petosa, R. L., & Shoben, A. (2018). Peer mentor versus teacher delivery of a physical activity program on the effects of BMI and daily activity: protocol of a school-based group randomized controlled trial in Appalachia. *BMC Public Health*, *18*(1), N.PAG. doi:10.1186/s12889-018-5537-z

Terry, D., Ervin, K., Soutter, E., Spiller, R., Dalle Nogare, N., & Hamilton, A. J. (2016). Do Not "Let Them Eat Cake": Correlation of Food-Consumption Patterns among Rural Primary School Children from Welfare and Non-Welfare Households. International Journal Of Environmental Research And Public Health, 14(1). https://doi.org/10.3390/ijerph14010026

Tipton, J. A. (2016). Reducing Sugar-Sweetened Beverage Intake Among Students. *NASN School Nurse*, *31*(2), 102–110. https://doi.org/10.1177/1942602X15578456

Vanderlee, L., Manske, S., Murnaghan, D., Hanning, R., & Hammond, D. (2014). Sugar-Sweetened Beverage Consumption Among a Subset of Canadian Youth. *Journal of School Health*, *84*(3), 168–176. https://doi.org/10.1111/josh.12139

Vella, S. A., Cliff, D. P., Okely, A. D., Scully, M. L., & Morley, B. C. (2013). Associations between sports participation, adiposity and obesity-related health behaviors in Australian adolescents. *The International Journal Of Behavioral Nutrition And Physical Activity*, *10*, 113. https://doi.org/10.1186/1479-5868-10-113

Wang, M. L., Lemon, S. C., Clausen, K., Whyte, J., & Rosal, M. C. (2016). Design and methods for a community-based intervention to reduce sugar-sweetened beverage consumption among youth: H2GO! study. *BMC Public Health*, *16*(1), 1150. https://doi.org/10.1186/s12889-016-3803-5

Wolfe, W. S., Scott-Pierce, M., & Dollahite, J. (2017). Choose Health: Food, Fun, and Fitness Youth Curriculum Promotes Positive Behaviors. *Journal Of Nutrition Education And Behavior*. https://doi.org/10.1016/j.jneb.2017.09.008

Woodward, L. G., Gosliner, W., Au, L. E., Kao, J., Webb, K. L., Sagatov, R. D., … Ritchie, L. D. (2018). Community characteristics modify the relationship between obesity prevention efforts and dietary intake in children: the Healthy Communities Study. *Pediatric Obesity*, *13*, 46–55. https://doi.org/10.1111/ijpo.12434