Childhood Obesity: Long-Term Effects of Reducing Sugar-Sweetened Beverage Consumption, A First Step

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Obesity is a serious public health problem in the United States as it is associated with an increased risk of chronic illnesses such as coronary heart disease, hypertension, type two diabetes mellitus, various forms of cancer, liver disease, hyperlipidemia, stroke, sleep apnea, infertility (Centers for Disease Control and Prevention, 2013), various forms of disability, and increased risk of all-cause mortality particularly in adults younger than sixty-five years (United States Preventative Services Task Force, 2012). Childhood obesity carries additional risks such as asthma, hepatitis, early puberty, social isolation, depression, anxiety and increases the risk for early onset and ongoing adult health problems (Wang, Chyen, Lee, & Lowry, 2008).

Chronic illnesses, along with decreased length and quality of life, are becoming greater concerns as rates of obesity among youth ages twelve to seventeen have tripled in the last thirty years. There is an urgent need to identify interventions, especially for subpopulations at highest risk (Kenney, Wang, & Iannotti, 2014). Trends in the literature reveal higher rates of obesity and associated co-morbidities in rural residents compared with urban dwellers of similar socioeconomic status. Rural areas are home to over nineteen percent of the United States population or approximately sixty million people (United States Census Bureau, 2010). Although this population often experiences decreased access to healthcare, these patients tend to utilize more secondary, tertiary, and costlier healthcare services with poorer long-term outcomes. The Institute of Medicine (IOM) (2012) estimates the annual cost of obesity at 190.2 billion dollars per year, nearly twenty-one percent of national health care spending. Childhood obesity alone is responsible for fourteen billion dollars' worth of these direct medical costs. These

physical and financial costs make rural populations and their ailments a major concern and an area where successful public health interventions could have a significant impact.

According to the Centers for Disease Control and Prevention (CDC) (2011), one-third of preschool children ages two to five years are overweight or obese. In Oregon's North Wasco County School District, over thirty-eight percent of school-aged children are overweight or obese (North Central Public Health Department, 2015), ranking these youth at higher than the national average risk for chronic illness. The North Central Public Health Department has developed a coalition and made a commitment to decrease the prevalence of childhood obesity.

The purpose of this public health initiative project is to target public health interventions at the "contextual" level. According to Frieden's Health Impact Pyramid (2010), which details factors influencing population health and levels of possible intervention, changes at the contextual level will influence the environment so individuals' default decisions are positive, healthy choices. In this project, education and incentives were implemented to encourage local businesses to adopt a policy for a reduction in the sale and provision of sugar-sweetened beverages (SSB) to children and their families. Policy components included the following interventions: 1) providing one drink size only and 2) no longer offering free refills of SSB. The target population for this intervention was primarily school-aged children, but includes adults as many studies have shown strong correlations between the level of parental health and lifestyle to the body mass index (BMI) of their children (Vollmer, Adamsons, Gorin, Foster, & Mobley, 2015).

This project was an initial step toward improving public health; a step that has been similarly shown in previous studies to have long-range effects on decreasing populations' average BMI. The results of this program were used to demonstrate the success of public health

initiatives and promote ongoing interventions to improve the health of the community. The only level of the Health Impact Pyramid that would have had a higher level of influence would be the socioeconomic level in which factors such as poverty, education level, housing, and inequality would be addressed. While these factors are important to population health, they require a broader politically and socially structured change, which is unfortunately outside the current financial and influential reach of the local public health department. Creating a healthier environment for the entire population, one that promotes positive individual choices, has been shown to make a long-term contribution to the reduction of childhood obesity (Popkin, Duffey, & Gordon-Larson, 2005; IOM, 2007; Huang & Glass, 2008).

Review of the Literature

A review of pertinent literature was conducted to fully explore the background and progression of childhood obesity, factors contributing to the issue, influence of parental health, previously attempted changes, and interventional areas for ongoing improvement. Search terms and combinations of terms were used to identify relevant articles via the PubMed resource tool. Search terms included ‘sugar-sweetened beverages’, ‘childhood obesity’, ‘environmental factors’, ‘policies’, ‘proportional pricing’, ‘feeding practices’, ‘parental health’, and ‘prevention’. Articles were reviewed for relevance to the school-aged population and application in the community setting. Information and recommendations from professional and government websites were used to identify policies, recommendations, and statistics.

The literature agrees that not only is childhood obesity a serious issue as it threatens both the health and mental well-being of those affected, but it is also a multifactorial problem which makes intervention much more challenging. Genetics, activity level, and eating patterns all have the ability to affect the health and BMI of a child to varying degrees. Genetics influence an

individual child's susceptibility to becoming overweight or developing obesity. However, in the last thirty years, the prevalence of childhood obesity has tripled (Kenney, Wang, & Iannotti, 2014). This trend has occurred too rapidly to be explained by an evolutionary process causing a change in individuals' ability to metabolize food (IOM, 2012). Therefore, population obesity must be correlated to changes in the environment and behavior patterns causing children to eat more and exercise less. Efforts to curb this trend must be focused on these factors if they are to be successful.

Modern children experience decreased active transportation such as walking to school, decreased access to daily physical education classes, and increased options for and access to sedentary screen time (Centers for Disease Control and Prevention, 2013; Sturm, 2005). These changes in activity level are due, at least in part, to societal and technological changes to the environment such as transportation infrastructure, land-use, and urban design (Frank, Engelke, & Schmid, 2003; Frank & Engelke, 2001). In the past, individuals could complete daily tasks by walking from one location to the next. City planning with increased space between business and domestic areas of town has made the use of motorized vehicles more necessary. Increased automobile use has decreased walking and bicycling and has increased road traffic. Urban planning and land-use zoning practices are often aimed at improving this heightened traffic flow, inadvertently decreasing space for sidewalks. The city of The Dalles, home to the North Wasco County School District, struggles with many of these environmental issues, particularly a lack of sidewalks. Issues, such as lack of sidewalks and distances to local business, are also seen in surrounding less populated cities and counties. The majority of these citizens must travel a minimum of ten miles to the nearest grocery store or school. Programs to promote safe routes to school, petitions to allocate public land for recreation centers, and public education displays to

decrease computer/video/television screen time have been initiated in an attempt to modify the environmental factors leading to inactivity and the expanded prevalence of childhood obesity.

The other major contributing factor to population obesity is overconsumption of energy or calories. Particularly problematic are foods with low nutritional value, but high caloric density. While certain foods such as fries, burgers, or pizza are high in fat and calorie content, they do provide some nutritional value but, most importantly, they provide satiety. Obesity is not just a matter of taking in too much energy, but is also affected by the types of foods consumed and their effect on the physiological signals for satiation. Sugar-sweetened beverages not only displace beneficial beverage choices such as milk or water, but are a source of high energy with minimal subsequent compensation from the body to decrease further caloric intake (Woodward-Lopez, Kao, & Ritchie, 2010).

The literature, including public trend data and randomized controlled trials, agrees sugar-sweetened beverages are directly associated with poor dietary quality and obesity for children. According the United States Department of Health and Human Services and the Department of Agriculture (2010), SSB consumption is the single largest contributor of calories to the American diet. Woodward-Lopez, Kao, and Ritchie (2010) found SSB consumption accounted for at least twenty percent of the weight increase in the United States between 1977 and 2007. For children ages two to eighteen, SSBs account for more calories and added sugar (without any nutritional value) than most other food groups, beside grain-based desserts and pizza (National Cancer Institute, 2010). Over the last thirty years, soft drink consumption by school-aged children increased by approximately one-hundred milliliters per day and overall calorie intake increased by almost two-hundred calories per day (Piernas & Popkin, 2011; Poti & Popkin, 2011). Childhood obesity has tripled during this same time frame. Studies conducted in which SSBs

were either removed or replaced with a nutritious beverage in children's diets showed lower BMIs and less fat accumulation in the intervention group compared to the control group (de Ruyter, Olthof, Seidell, & Katan, 2012; Ebbeling et al., 2012; Shang et al., 2012).

Many factors must be considered when attempting to understand children's increased consumption of SSBs. Studies into behavioral economics suggest many behaviors, such as food choices, are routine rather than a deliberate decision (Just, Wansink, Mancino, & Guthrie, 2008; Just & Payne, 2009). Some of these reaction-based choices may be due to the increased percentage of calories children consume away from home and the minimal monetary cost of sugar-sweetened beverages. On average, thirty-four percent of a child's daily energy intake occurs outside the home (Poti & Popkin, 2011). Food marketing aimed at children has increased and often it's the low-nutrient, high-fat and sugar-dense foods that are available in larger portions and at lower prices (Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). The IOM's goal for obesity reduction is to prevent progression by maintaining a healthy weight trajectory while children grow and develop (IOM, 2010). This is accomplished through primary prevention strategies focusing on the population as a whole. Changing the environmental cues through policy intervention to prompt healthier, routine choices could cause positive shifts in population behavior (Frieden, Dietz, & Collins, 2010).

Implementation of policies and environmental changes should begin with a focus on the populations at highest risk. Children and adolescents in the Hispanic and African American populations, along with those living near or below the poverty line, are at increased risk for developing obesity (Freedman & Centers for Disease Control and Prevention, 2011). Evidence shows racial/ethnic minorities and low-income populations experience a greater exposure to environmental factors associated with increased rates of obesity (Kumanyika, 2008). Lee et al.

(2015) found communities with higher percentages of racial/ethnic minority populations had fewer and weaker environmental policies concerning calorie-dense foods and sugar-sweetened beverages. The North Wasco County School District student body is thirty-five percent comprised of racial/ethnic minorities and over eighteen percent of the county is below the poverty line (United States Census Bureau, 2015; U.S. News and World Report, 2015). According to the United States Census Bureau (2015), Sherman and Gilliam Counties have lower percentages of both minorities (five percent each) and families below the poverty line (fourteen and twelve percent respectively). Although these counties are home to a smaller percentage of high-risk populations this project was expanded to include these counties. These three counties share membership on the local board of health and are home to the two primary coordinated care organizations (CCOs) in eastern Oregon. In past studies, Smith, Lin, and Lee (2010) found a ten percent increase in carbonated beverage prices were associated with a decrease in the average child's BMI. Many additional studies have concluded pricing interventions are likely to have an effect on weight, especially in children from low-socioeconomic households (Finkelstein, Zhen, Nonnemaker, & Todd, 2010; Sturm, Powell, Chriqui, & Chaloupka, 2010; Powell and Chaloupka, 2009; Powell, Chriqui, & Chaloupka, 2009). Therefore, a program designed to remove the incentive of low-priced, high-volume SSBs in restaurants and businesses could appropriately modify the local environment to promote healthier default choices.

The IOM (2012) recommends the implementation of practices to reduce overconsumption of SSBs. This can be accomplished by pricing and incentive strategies to make healthy drink options more appealing. A review conducted by Andreyeva, Long, and Brownell (2011) found food consumptions and money expenditure to be price sensitive. Therefore,

implementing no free-refill policies in local businesses could remove the fiscal motivation to consume large quantities of SSB. Applying these policies to all beverages, not only children's, will raise awareness and potentially affect the health of parents and other family members as well. This is important as correlations have been shown between physical activity level, eating habits, and BMI of parents to that of their children (Vollmer, Adamsons, Gorin, Foster, & Mobley, 2015). Parental obesity has been found to more than double the risk of adult obesity in children under the age of ten (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). Therefore, the entire family must be included in order to address obesity at the population level. Further, it was hypothesized that developing a social marketing campaign to reduce consumption of SSBs would not only highlight and reward businesses who comply with the policy, but would serve to stimulate community education regarding risks associated with overconsumption of SSBs.

In summary, Wasco, Sherman, and Gilliam counties, in Oregon, comprised an ideal location to implement an initiative to decrease childhood obesity as the prevalence in this area is higher than state or national averages. The Wasco County school district is comprised of a significant percentage of low-income households and racial/ethnic minorities, both of which are populations at increased risk for obesity. According to previously discussed literature, these populations are likely to respond to SSB price changes by decreasing their consumption. Informative meetings were undertaken with restaurant owners to implement a policy to discontinue the practice of free-refills. A social marketing campaign in the form of restaurant window stickers, advertisements, and newspaper articles accompanied the restaurant policy change to promote community public health awareness. Targeting this epidemic at the population level by implementing environmental changes designed to promote healthy choices

by children appears to have promise for success in the future. This is one of the first steps in the process of making a generational change in health.

Approach to Conduction and Implementation of the Project

Initial efforts by the Wasco County Coalition to Reduce Childhood Obesity began in 2013 and were supported by the Columbia Gorge Health Transformation Grant, supplied by the Columbia County CCO. Their work began with measuring the BMIs of children at the largest schools in The Dalles and implementation of interventions aimed at parental education and increased daily physical activity. Recognizing the severe scope of their local health problem, project members joined with community members and local leaders to form the Coalition and developed their "community action plan to reduce childhood obesity". The action plan was a commitment to support efforts in the reduction of childhood obesity in Wasco County, signed by local politicians, leaders, and business owners. All programs under this actions plan, designed to increase physical activity, improve nutrition, or decrease consumption of SSBs, were labeled as "Fit" programs in order to unify the various projects.

The initial project plan to reduce consumption of SSBs was initially planned to be carried out in the city of The Dalles, under the banner of the Sugar-Sweetened Beverage workgroup. As interest spread, the project was later expanded to include surrounding cities of Wasco County and those of both Sherman and Gilliam Counties. While obesity and the health of youth can be sensitive subjects, through their support of the coalition and particularly of this project, the communities demonstrated their readiness for change. Anticipated barriers included business owners' reluctance to make changes that could cost money, anxiety toward upsetting customers who have come to expect free refills, and fear of losing business through decreased SSB sales. To offset these anxieties, an incentive plan was developed to provide a ten percent discount on

restaurant licensing fees for those participating in the program. Informational table tents for participating restaurants were also created to provide an explanation of the program to patrons, thus diminishing surprise or disappointment with the new restaurant policy and provoking thought regarding nutrition and community programs. The program was submitted for review by the Oregon Health Authority and was approved with the caveat that non-participating businesses would not be penalized in order to produce the discount to those supporting the program. These licensing discounts and printing costs were provided by a grant from the Eastern Oregon CCO (EOCCO) which includes Sherman and Gilliam Counties. Other facilitators to the project included free advertising in a local newspaper series highlighting participating restaurants, promotion through the chamber of commerce, and recognition from community members as a "Fit" business. Logo stickers were developed through cooperation with a local art student for display in windows of businesses who joined the program.

The target population included all local restaurants. Restaurants that were excluded from the project at this time were those not catering to children and chain restaurants. Chain restaurants operate by regulations developed at a corporate, national level and so the local owner or manager does not have the ability to make menu or service changes. A long-range goal of this project was to develop a "new norm" in which local residents expect restaurants to charge for beverage refills. At that point, county legislation could be implemented requiring chain restaurants to comply with the program. Collection of personal data wasn't necessary for this project, so no individual participants were at risk.

Outcomes and Implications

The literature regarding changes in obesity prevalence generally states that in order for individual changes in dietary habits to be successful, meaningful changes must be made at a

societal level (World Health Organization [WHO], 2000; Foresight Programme, 2007; White House Task Force on Childhood Obesity, 2010). Further, contributing stakeholders in addressing the obesity epidemic find these societal changes must be implemented through a public health approach, focus on policy changes, and that interventions must take place in the "environments in which people live, learn, work, and play" (IOM, 2012, p. 107). The Institute of Medicine (2012) states that considerations must be made for the practicality of an intervention such as 1) modern lifestyles, 2) public sentiment toward government policies related to consumption behaviors, and 3) potential negative impacts of obesity prevention programs on high-risk populations such as minorities or low-income families.

The SSB Reduction Program did account for these considerations during the planning, implementation, and follow-up phases. According to the United States Healthful Food Council (2016), the average American eats nearly six meals per week at a restaurant. Not only are restaurants environments for increased sugar, salt, and fat intake, but six meals per week means families are spending a significant amount of time at these locations. This increase in the number of meals consumed outside the home is a reflection of our modern society where many family income earners must work long hours, leaving less time for food preparation and home-cooked meals. These factors made local restaurants the ideal site for policy changes and display of educational materials. While the absence of free refills of a patron's SSB may not in itself significantly reduce calorie consumptions and directly affect obesity rates, this campaign increased awareness of the issue, provided informational resources, and environmental cues to prompt thoughtful (and hopefully healthier) choices. Obesity is a complex issue that requires multifocal and long-range interventions such as this campaign.

Public sentiment toward government enforced policies surrounding food and drink consumption was an important factor to consider. Protecting personal freedom carries a high level of importance in American society, even when those choices lead to decreased health and quality of life. This sentiment was pointedly illustrated when Mississippi governor Phil Bryant signed the "Anti-Bloomberg Bill" banning food regulation policies such as calorie counts on menus or control of portion sizes. This bill was passed following Mayor Bloomberg's failed attempt to implement a policy in New York City that would place a limit on the size of soft drinks sold. The "Anti-Bloomberg Bill" was passed despite evidence linking obesity with serious health problems, the fact that Mississippi is the third most obese state in America, and is the state with the lowest life expectancy (Neporent, 2013; Trust for America's Health & Robert Wood Johnson Foundation, 2014). With this resistant public attitude demonstrated toward previous health policies, the SSB Reduction Program was deliberately promoted through positive language, incentives, and voluntary participation. If the community were to become resistive to the program or harbor a negative perspective, there would be no benefit in the initiative. The Oregon Health Authority was in agreement with this positive plan as they consented to a reduction in restaurant licensing fees for participating owners so long as this revenue wasn't compensated for by penalizing non-compliant restaurants. To accomplish its long-range goals, the program needed to be accepted and supported within the community. By initiating changes with local restaurant owners who are active members of the community, the program was viewed as encouraging rather than controlling.

Finally, the potential negative impacts of an obesity-reduction program were considered. First, the SSB committee recognized the risk business owners perceived in changing their menus and service standards. Therefore, we provided incentives to reward participating businesses,

educational materials with clear explanations for the aim of the project, and publicly visible health department contact information to field any questions or concerns. Public presentations were focused on the benefits of reaching and maintaining a healthy weight. The goals of the project were to improve the lives and health of school-aged children, not to perpetuate negative stereotypes or implications that parents of obese children have "failed" in feeding their children appropriately. Minorities and low-income families are at greater risk for becoming obese and such negative perceptions can be detrimental in school, social, and work environments. Therefore, information must be presented with respectful terminology, but also accurately present evidence of the increased exposure to environmental factors that predispose these groups to low physical activity and excess caloric intake (Kumanyika et al., 2008).

The Coalition to Reduce Childhood Obesity and its initial efforts was funded by the Columbia County CCO. The SSB Reduction Program was supported by the Eastern Oregon CCO (EOCCO) who financed the restaurant licensing fee reduction incentive and the printing costs of the educational materials. Between January fifth and March fifth, 2016 restaurant owners in the cities of Grass Valley, Rufus, Wasco, Arlington, Condon, Dufur, Maupin, Tygh Valley, and The Dalles were approached. They were provided a brief informational handout regarding the public health issue of obesity and a presentation of the SSB Reduction Program benefits. Any owner's concerns were addressed during this meeting and contact information to the North Central Public Health Department was provided to answer any additional follow-up questions. After the maximum number of businesses had been approached (limited by available funding), project contracts were sent to each owner and returned by mail to confirm participation.

The SSB Reduction Program, along with other local efforts, can create momentum for school-aged children's improved dietary health and future health improvement interventions. Measures with which to track progress of this effort are critical. However, identifying a specific outcome measure by which to mark success was difficult during this short-term initiative. "Progress in achieving obesity prevention can be assessed in the short term by indicators of change in the environments that influence physical activity and eating" (Institute of Medicine, 2012, p. 80).

Restaurants were not approached if they were a part of a chain and excluded if they didn't allow minors on the premises. Since funding for this program came from the EOCCO, which covers Sherman and Gilliam Counties, restaurants within cities belonging to these counties were approached first. Twenty-four restaurants were approached in total. Three businesses were excluded, two owners declined to participate, and nineteen restaurants were successfully enrolled in the program. At this point, no additional restaurants were approached because the entirety of the grant had been allocated. The next step was a presentation of the program results to the local board of health. The board members included county commissioners and two community members from each of Sherman, Gilliam, and Wasco counties. The board members stated the participation rate was much higher than they had anticipated, demonstrating a high level of community support. The goal of this presentation was to validate the investment and efforts made so far and to establish a sustainable source of funding. This would allow the remainder of local restaurants to join the program with continued licensing incentives. Following the board of health presentation, the EOCCO agreed this program will improve the health and lives of community members. The EOCCO therefore committed to provide funding for any number of restaurants to join the program. During the project period, nearly eighty percent of restaurants

approached joined the program. This percentage was validated as significant by the board of health. This significant community participation combined with the commitment for ongoing financial support is a compelling indicator of environmental change. Therefore, according to the standards of the IOM (2012), this is a successful program as it has created environmental changes that can influence eating behaviors.

This project was the first of many steps that can contribute to the reduction of childhood obesity. The program is functioning as an awareness campaign on multiple levels. The small change in environmental cues caused by restaurants charging for SSB refills has the potential to shift the populations' behavior by creating an *option* for a second beverage rather than routine, thoughtless consumption of high calorie drinks. This deliberation over beverage choice may prompt consideration of other healthy choices and the displayed table tents will provide information and access to public health resources. Public awareness will hopefully lead to increased community participation in other health promotion projects and eventually to local policy changes.

Summary

Obesity is a complex, multi-generational, multifactorial health issue that can contribute to many disease processes and loss of quality of life. The North Central Public Health Department identified school-aged children in their community as demonstrating a higher prevalence of obesity than the national average. SSBs have been more strongly linked to obesity than any other food or beverage (Dietary Guidelines Advisory Committee, 2010), making their consumption a prioritized point for intervention. Behavioral studies suggest most dietary choices are routine habits rather than thoughtful decisions (Just, Wansink, Mancino, & Guthrie, 2008; Just & Payne, 2009). These habits are influenced by socioeconomic factors and environmental

cues. Changing environmental factors provides an opportunity for individuals to consider their choices. This consideration can lead to more thoughtful and healthier behaviors. Many restaurants advertise free refills of SSBs and servers are trained to refill glasses without being asked. By changing this policy, patrons must *choose* to have a second SSB. While the reduction in SSBs caused by this policy change isn't likely to be calorically sufficient to reduce obesity itself, the SSB Reduction Program has potential for a more significant impact. The program prompts awareness by changing the environment and provides resources for continued public health improvement. With these environmental changes, routine choices are more likely to be healthy, leading to shifts in the population's behavior and healthier body weights for the children. Obesity became a health concern over multiple generations as our society, infrastructure, and way of life changed. Altering this accepted way of life and its repercussions will take time and commitment as well. This program is one of many interventions that will lead to a healthier, brighter future for our country's youth.

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