

Exploring Healthy Vending Contracts as a Localized Policy Approach to Improve the
Nutrition Environment in Publicly Funded Recreation Facilities

by

Cassandra Lane
B.A., University of Victoria, 2015

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Supervisory Committee

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Abstract

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Objective: Many Canadian publicly funded recreation facilities have an obesogenic environment. Researchers recommend food and beverage policies to change these environments, however further research is needed to distinguish effective policy approaches. A promising, localized policy approach not yet well evidenced is the use of vending machine contracts with health stipulations to improve nutrition environments. The primary objective of this study was to determine whether a sample of Canadian publicly funded recreation facilities with healthy vending contracts had healthier vending machine nutrition profiles than those facilities with conventional contracts. A secondary research objective was to explore the additional influence of policy quality on the health profile of vending machines. *Methods:* This quantitative study used results from the baseline assessment done of the broader Eat, Play, Live (EPL) initiative. Vending machine audits and questionnaires were completed in participating publicly funded recreation facilities with vending machines (N=46). Vending product profiles were assessed using the Brand Name Food List which categorizes packaged foods according to the BC Guidelines for Vending in Public Buildings. Mann-Whitney *U* tests were used to determine if there were significant differences in the health profile of vending products between facilities with healthy vending contracts and those without. *Results:* Facilities with healthy vending contracts had significantly healthier vending product profiles

compared to facilities with conventional contracts. On average, significantly less availability of unhealthy (DNS) products represented these healthier profiles. Vending profiles did not significantly differ based on higher quality contract health stipulations although sample size limited conclusions about this. *Conclusion:* Facilities with health stipulated in their contract differed from those without health stipulations. This suggests that healthy vending contracts (even with relatively generic stipulations) may be supportive of improved nutrition environments.

Keywords: policy, vending machines, contracts, publicly funded recreation facilities

Table of Contents

Supervisory Committee	ii
Abstract	iii
Table of Contents	v
List of Tables	vii
List of Figures	viii
Acknowledgments.....	ix
Dedication	x
Chapter 1: Introduction and Literature Review	1
Introduction.....	1
Obesogenic Environments: Contributors to Childhood Obesity	3
Policy Approaches to Improve Nutrition Environments	4
Government Level FB Policy	6
Non-Government FB Policy	11
High-Quality Policy Characteristics	13
Mandated Policies	15
Restrictions/Nutrition Standards within Policies	17
Comprehensive Policies.....	19
Monitored Policies	20
Types of High-Quality FB Policies.....	21
Healthy Vending Contracts.....	23
Obesogenic Publicly Funded Recreation Facilities	27
Healthy Vending Contracts in Publicly Funded Recreation Facilities	31
Summary	31
References.....	32
Chapter 2: Manuscript.....	46
Introduction.....	46
Obesogenic Publicly Funded Recreation Facilities	51
Research Purpose and Objectives	52
Methods.....	53
Research Design.....	53
Ethics Statement.....	55
Participation	55
Data Collection	56
Data Analysis	58
Results.....	59
Descriptive Statistics.....	59
The Influence of Healthy Vending Contracts Versus Conventional Contracts on the Health Profile of Vending Machines	61
The Influence of Policy Quality (Specificity and Monitoring) on the Health Profile of Vending Machines in Facilities with Healthy Vending Contracts	63
Discussion.....	65
The Efficacy of Healthy Vending Contracts.....	66
Impact of Policy Quality on the Health Profile of Vending	69
When Contracts Come up For Tender	70

Limitations	71
Conclusion	72
References	73
Appendix.....	86
Appendix A.....	86
Appendix B.....	88
Appendix C.....	89
Chapter 3: Summary, Implications for Public Health Policy and Practice, and Recommendations for Future Policy Research.....	92
Summary.....	92
Implications for Public Health Policy and Practice	94
Recommendations for Future Policy Research.....	95
References.....	96

List of Tables

Table 1. Descriptive Statistics for the Health Profile of Beverage and Snack Vending Machines Based on the % of DNS, SS and SM Products Revealed in Vending Audits	59
Table 2. Descriptive Statistics for the Mann-Whitney U Tests with the Dependent Variables of Healthy Vending Contracts and Conventional Contracts	89
Table 3. Descriptive Statistics for the Mann-Whitney U Tests with the Dependent Variables of Contracts With and Without Specific Health Stipulations.....	90
Table 4. Descriptive Statistics for the Mann-Whitney U Tests with the Dependent Variables of With and Without a Monitoring Component	91

List of Figures

Figure 1. EPL research design and timeline	54
Figure 2. A model describing elements of the food environment in publicly funded recreation facilities where opportunities for healthy food and beverage initiatives are present.	55

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Dedication

I would like to dedicate this thesis to my parents, whose accomplishments, perseverance and selflessness nurtured my passion for public health and inspired me to undertake this venture.

Chapter 1: Introduction and Literature Review

Introduction

Childhood obesity is recognized in Canada and internationally as a public health epidemic (Public Health Agency of Canada [PHAC], 2011; World Health Organization [WHO], 2016), with 31% of Canadian children overweight or obese according to results from the 2012 to 2013 Canadian Health Measures Survey (Statistics Canada, 2015). The WHO (2018) defines overweight and obesity as abnormal or excessive fat accumulation associated with health impairments such as diabetes, musculoskeletal conditions and cardiovascular disease. The negative health repercussions for children include increased likelihood of adult obesity, breathing difficulties, insulin resistance and social and psychological impacts (WHO, 2018).

Despite awareness of obesity and accompanying health concerns (PHAC, 2011; Hodgson, Corscadden, & Taylor, 2011; WHO, 2016; 2018), limited progress has been made in reversing obesity trends (Kleinert & Horton, 2015; Roberto et al., 2015). For example, Canadian childhood obesity trends have remained stable over the past ten years, yet the prevalence of excess weight in this population persists (Rao, Kropac, Do, Roberts, & Jayaraman, 2016). Factors contributing to obesity prevalence include behavioural determinants such as physical inactivity, sedentary behaviour and unhealthy diets, as well as environmental and social determinants (PHAC, 2011; WHO, 2016).

The consumption of unhealthy foods, defined in the glossary of terms from the *Report of the Commission on Ending Childhood Obesity* as “foods high in saturated fats, trans-fatty acids, free sugars or salt (i.e. energy-dense, nutrient poor foods)” (WHO, 2016), is now widely accepted as directly related to childhood obesity (Foltz et al., 2012;

Hodgson et al., 2011; Lobstein et al., 2015; WHO, 2016; Rao et al., 2016). According to the latest status report on childhood obesity in Canada, less than half of children and youth are consuming healthy diets (Rao, Kropac, Do, Roberts, & Jayaraman, 2017). Greater consumption of unhealthy foods and beverages among low income Canadian youth (Rao et al., 2017) aligns with previous research associating childhood obesity and income levels (Rao et al., 2016) and poverty, obesity, and diet quality (Drewnowski, 2009) and further emphasizes the urgency for action. Although steps have been taken to improve food consumption in children, further universal efforts that also recognize and account for inequities are clearly necessary.

This literature review provides an overview of the importance of the environment and policy approaches to influence positive change in obesogenic settings. It specifically addresses the various levels of policy and examines the benefits of local and non-government policy approaches. A discussion of high-quality policy characteristics (i.e., mandated, restrictions and/or nutrition standards within policies, comprehensive and monitored) and different policy tools (e.g., health taxes, and environment-focused policies) follows. Contracts are explored as a specific area of policy development of interest in shifting the food environment landscape. The review concludes by detailing the extent to which publicly funded recreation facilities contradict their health promoting ideals by having an obesogenic food environment (Chaumette, Morency, Royer, Lemieux, & Tremblay, 2008; Naylor, Bridgewater, Purcell, Ostry, & Vander Wekken, 2010; Thomas & Irwin, 2010), and how healthy vending contracts may be useful in addressing this public health issue. Few studies have examined the influence of policy quality on the food environment in the setting of publicly funded recreation facilities,

particularly in relation to vending machines, so literature from tobacco control policy research and policy-based evidence in settings such as schools, hospitals, parks, and sport settings is also discussed.

Obesogenic Environments: Contributors to Childhood Obesity

In the past, obesity was often misinterpreted as being primarily the result of voluntary lifestyle choices, including the choice to consume unhealthy foods (Alvaro et al., 2011; Raine, 2005; Roberto et al., 2015; Traverso-Yepez & Hunter, 2016). This placed substantial responsibility on the individual and, while individuals do have a responsibility for their own health (Roberto et al., 2015), it is now acknowledged that effective health promotion also requires creating supportive environments (Baum, 2007). More specifically, to effectively decrease the prevalence of childhood obesity, initiatives must also target the environment in which people live and children spend their time (Olstad, Goonewardene, McCargar, & Raine, 2015; WHO, 2016; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008).

In a synthesis of the determinants of healthy eating in Canada, Raine (2005) summarized six conceptual articles focused on individual determinants (e.g., personal food choices) and collective determinants (e.g., social and physical features of the environment) that influenced healthy eating. Raine (2005) described the strong influence food environments had on individual food and beverage choice by controlling what was available, affordable, and accessible. A systematic review of the determinants of healthy eating in children and youth also described the profound influence of food availability on consumption patterns (Taylor, Evers, & McKenna, 2005). The authors emphasized that while biological and familial factors impacted eating behaviour, environmental features

prevailed more powerfully. These conclusions are congruent with recommendations to shift the focus of obesity interventions from individual behaviour to the environmental factors that profoundly impact individual choice (Roberto et al., 2015; Traverso-Yepez & Hunter, 2016). This perspective is exemplified in the WHO (2016) position statement that childhood obesity should not be individualized due to the strong influence of both biological and contextual factors.

According to the WHO (2016), obesogenic environments have an exceptionally negative influence on food consumption because they expose individuals to, and promote high energy intake and social acceptability of, unhealthy consumables. Of particular concern is the impact that obesogenic environments can have on children – a population without control over the causal mechanisms of unhealthy behaviour (WHO, 2016), and whose exposure to obesogenic environments remains an issue regardless of parental supervision (Lobstein et al., 2015). The social justice implications of obesogenic environments also raise concern, considering research has linked the nutrition environment and health disparities (Glanz, Sallis, Saelens, & Frank, 2005). The idea that obesogenic environments contribute to the childhood obesity epidemic and potentially enhance persisting health inequities provides an ethical impetus for action. The evidence provided in subsequent sections of this literature review supports the use of policy to improve the food and beverages available in settings where children spend their time, with priority given to those that are known to be obesogenic.

Policy Approaches to Improve Nutrition Environments

Policy-based approaches have had consistent success in reaching public health goals; perhaps most markedly in tobacco control. Eleven computational model studies

examining smoke-free policies in indoor spaces all revealed positive outcomes from this/these policy intervention, including decreased smoking prevalence, smoking-related health complications, smoking-attributable deaths, and medical costs (Feirman et al., 2017). While findings of computational models only offer projections, the researchers described many advantages to this methodology (e.g., accounting for complex influential factors and generalization of empirical research). Other descriptive research based on 19 years of data collection found that smoke-free air policies reduced smoking prevalence for a sample of youth sub-populations in the U.S.; most notably for those of high socioeconomic status (SES) (Tauras, Huang, & Chaloupka, 2013).

In addition to reaching public health goals, policies may facilitate long term change by influencing social norms. Clean air tobacco control policies, for example, were initially controversial but ultimately contributed to widespread acceptability of smoking restrictions (Schwartz, Just, Chriqui, & Ammerman, 2017). Research also linked smoke-free air policies and decreased tobacco use via denormalization processes that changed perceived norms and promoted widespread awareness (Satterlund, Cassady, Treiber, & Lemp, 2011a). Hawkins, Bach and Baum (2016) found that 100% smoke-free restaurant legislation contributed to reduced likelihood of adolescent smoking in 29 of 43 U.S. states. These researchers attributed this in part to reducing opportunities for cigarette use and changing social norms, and estimated that smoke-free legislation in the remaining states would further decrease adolescent smoking rates. Tobacco policy research in Australia also showed lower prevalence of youth smoking with clean-air restrictions based on self-reports over a 15 year period (White et al., 2011). The researchers hypothesized that a quick, three-year introduction of clean-air restrictions in six out of the

seven Australian states contributed to changed social norms that led to successes in youth tobacco control.

Tobacco control policy has had undeniable success in changing environments and social norms for the public good. Similar to the powerful influence policy had on reducing tobacco consumption, food-related policies are believed to be the most effective and efficient mechanism in reducing unhealthy food consumption (Schwartz et al., 2017). Swinburn et al. (2011) highlighted numerous strengths of policy-based obesity interventions stating that: “they tend to be sustainable, affect the whole population (including those who are difficult to reach), become systemic (affect default behaviours), and reverse some of the environmental drivers” (p. 810). Perhaps most pertinently, policy has the potential to address inequalities in diet quality (Drewnowski, 2009), and establish healthy eating preferences earlier in life by exposing children and youth to healthy foods (Schwartz et al., 2017; Hawkes et al., 2015).

All levels of society have a role to play in developing and implementing Food and Beverage (FB) policy; however, governments have a responsibility to the public whom they represent. In a synthesis of evidence designed to inform healthy food and beverage procurement policies in Canada, Raine and colleagues (2018) stated that “Governments are responsible for stewardship of public funds and ensuring that food and beverages purchased promote the health of the population served” (p. 12). Government action in FB policy may take place at the federal, provincial/state, and/or local level.

Government Level FB Policy

To date, the Canadian Federal Government has taken minimal action in nutrition-related FB policy, choosing to focus on more traditional areas like food safety and fraud

prevention (MacRae, 2011; Mendes, 2008). Provincial action is also partial, with some provinces implementing voluntary policies in the form of guidelines or recommendations which may limit their potential impact (McIsaac, Shearer, Veugelers, & Kirk, 2015; Olstad, Downs, Raine, Berry, & McCargar, 2011; Olstad, Lieffers, Raine, & McCargar, 2011). Federal and provincial/state policies would be considered as universal policies because of their broad reach. Universal policies have the potential to improve health through reducing the influence of broader health determinants (Milton, Moonan, Taylor-Robinson, & Whitehead, 2011). Other benefits to higher level FB policies include facilitating greater equity by levelling the playing field for the food industry (Olstad & Raine, 2013), and harmonizing lower level policies (Olstad, Poirier, Naylor, Shearer, & Kirk, 2015).

Despite the benefits of federal and provincial action in addressing obesogenic environments, many levels and types of policy are needed to effectively achieve desired public health outcomes (Crammond & Carey, 2016). The literature provides several examples of municipalities at the forefront of successful obesity interventions. One such example is found in an in-depth analysis which revealed Vancouver British Columbia (BC) as successful in food policy implementation, and displayed the feasibility of a Canadian local government as a site for FB policy (Mendes, 2008). Vancouver's food policy focused on all food aspects including nutrition, consumption, production and distribution. Its goals included the enhancement or development of food-related programs such as community gardens, and the integration of food issues into other areas of government. A thorough analysis of New York City (NYC), U.S. nutrition-related policies (e.g., strict food standards, trans-fat removal in restaurants, mandated calorie

posting in restaurants, and restrictions on size of sugar-sweetened beverages [SSB]) provided a more recent example of effective local food policy development (Sisnowski, Street, & Braunack-Mayer, 2016). This rigorous review of articles and policy documents along with key informant interviews, revealed policy success and improved social norms that led to evidence-informed recommendations for context-specific, policy-based obesity solutions in other jurisdictions. In both these examples, food policy success was supposedly due to public involvement and local strengths; for example, Vancouver considered local food policy staff essential (Mendes, 2008), and a motivated mayor championed the FB policies in NYC (Sisnowski et al., 2016)

The efficacy of local FB policy in improving the health of food environments is attributable to several factors. First, local governments may be better suited to overcome challenges with food policy faced by higher levels of government. For example, the Australian Commonwealth Government has been reluctant to intervene in obesity regulation primarily because of the burden regulation places on business and the complexity of food policy which necessitates responsibility across sectors (Crammond et al, 2013). Another considerable barrier in implementing higher levels of government food policy is industry opposition. A qualitative analysis of e-cigarette policy making in four U.S. cities revealed that higher levels of government were slower to adopt strong e-cigarette legislation compared to local governments, due to the powerful presence of cigarette companies (Cox, Barry, & Glantz, 2016). The researchers believed the swift response by local governments was largely because they placed a high priority on residents. They concluded, “as with earlier tobacco debates, local governments present a

viable option for policymakers and health advocates to overcome cigarette company interference in the policymaking process” (p. 556).

Second, local level FB policy may increase the effectiveness of, or set precedence for, higher level FB policy by increasing support and/or demonstrating policy value or lack thereof to higher level decision makers. For example, research linked local FB policy and increased adherence to provincial nutrition guidelines in a recreation setting (Olstad, Lieffers et al., 2011); and Mendes (2008) reported that Vancouver’s food policy approach induced similar action on a regional, national and even global level. Similarly, local health units in Ontario were considered favourably positioned to advocate for provincial or federal level e-cigarette legislation (Kennedy, Himel, Lambraki, & Filsinger, 2014). This suggests local policy as an avenue to improve implementation of, and adherence to, higher level policies.

Third, local governments play a substantial role in shaping resident’s health behaviours. They are closest to the population whose behaviours they intend to influence and are usually responsible for immediate urban environments (Crammond & Carey, 2016). Representatives from the Vancouver BC food policy task force described local governments as responsible for citizens’ well-being, and a thorough analysis of the policy implementation highlighted distinct advantages to municipal food policy, including potential for unique insight, ability to form local partnerships and build capacity, and capacity to address an important policy un-mandated by higher levels of government (Mendes, 2008).

Rhoades, Beebe, Boeckman and Williams (2015) examined the use of local-level tobacco control policy focused on changing social norms in Oklahoma U.S. communities.

Participating localities established community-based best practices that were ultimately effective in changing social norms relating to tobacco. These programs also led to greater change in rural, under-resourced communities – signifying greater likelihood of equitable health improvements via a local approach. A similar evaluation in California U.S. outdoor recreation spaces found successful tobacco policy enactment in most communities, attributed to tailoring policies to local conditions (Satterlund, Cassady, Treiber, & Lemp, 2011b). Other benefits of local policies include being close to the origin of health-related action, high motivation of local leaders, increased opportunity for inter-sector collaboration, and the ability to convert perspectives from the individual to the community (Mittelmark, 2001).

Despite the numerous benefits of FB policy by local governments, they may face constitutional and higher level government constraints, in addition to numerous public sector-related challenges (Ashe, Graff, & Spector, 2011). The former was experienced by NYC when enactment of a sugary beverage tax and a ban on soda food stamps was prevented due to legislation previously enacted by higher levels of government (Sisnowski et al., 2016). Challenges with any level of public sector FB policies include incongruity with the healthcare system which is focused on curing health impediments, external costs, lack of institutional origin, and the intersect of various policy areas (MacRae, 2011). Other barriers faced by government when creating and implementing policy strategies include short election cycles and frequent leadership changes, differing political priorities and ideologies, and meeting the needs of stakeholders with diverse interests (Rose & Cray, 2010). Again, NYC experienced many of these challenges; for

instance, the constant consideration of inclusive decision making and public education, and balancing the FB policy agenda with other political priorities (Sisnowski et al., 2016)

Therefore, while researchers hypothesize that reducing the prevalence of obesity requires government intervention (Crammond et al., 2013; Swinburn et al., 2011), effectively reaching desired outcomes necessitates a whole-of-society approach including non-government sectors (PHAC, 2011; Raine et al., 2018; WHO, 2016). According to the WHO (2016), this is necessary to mitigate the complexities of obesity and support existing obesity interventions.

Non-Government FB Policy

The previously detailed deficit of government FB policy emphasizes the need for non-government action. Perhaps a result of limited government intervention, responsibility in addressing obesity has already been abdicated primarily to individuals and private or non-government organisations (Swinburn et al., 2011). To address the childhood obesity epidemic, researchers have advocated specifically for civil society to increase pressure for industry change, create public awareness, and ultimately support government approaches (Moodie et al., 2013).

Tobacco reduction success stories in the U.S. highlight the efficacy of policy developed and supported by non-government entities. For example, 3 case studies found that local coalitions in collaboration with community partners and local business owners, established successful tobacco control interventions (Douglas et al., 2015); and according to ninety-six evaluation reports from a municipal tobacco control program, success resulted from policies established external to the public service (Satterlund et al., 2011b). Furthermore, both these cases illustrated achievement in both overcoming preventive

state-based barriers, and in setting precedence for policies in other sectors (Douglas et al., 2015; Satterlund et al., 2011b).

In addition to mitigating government-related challenges, FB policy developed and implemented by non-government entities may have another distinct advantage: originating closer to the desired area of change. This is a bottom-up approach that is acknowledged as an important element of health promotion, and a necessity for equitable health improvements (Baum, 2007).

A notable feature of FB policy developed and implemented from the bottom-up, is the potential to facilitate street level bureaucracy – i.e., action from those who interact at the “street level” with the people whom the policy intends to influence (Lipsky, 1980, as cited in Tummers & Bekkers, 2014). The discretion available to street-level bureaucrats improves both their freedom to make context-based choices, and their willingness to do so (Tummers & Bekkers, 2014). What is more, a bottom-up approach may be more effective in cases where street level bureaucrats have a considerable influence over the nutrition environment. For example, a U.S. study by Terry-McElrath, O’Malley, & Johnston (2012) found that when compared with the state or beverage suppliers, schools had greater influence in choice of vending beverage. A strength of this study was the data from a national representation of schools (N= 1519) collected between 2007 and 2009; however, findings were based on self-reports from school administrators which may have introduced a systematic bias.

Research also shows that street level bureaucrats within settings (e.g., managers, administrators, or other staff) may be better able to improve the availability of healthy food. School administrators such as principals are believed to have a substantial influence

on the food environment by implementing and enforcing healthy FB policies (Meyer, Conklin, & Turnage, 2002). Policies developed by parks and recreation administrators have also been linked to successful tobacco control policy (Satterlund et al., 2011b). Further, Sisnowski et al. (2016), stated that a contributor to successful changes in NYC obesity policy was the use of “lower-level policy entrepreneurs to drive the effort at a technical level” (p. 26). This research supports the efficacy of FB policies developed and implemented from the bottom-up, by non-government civil society and/or street-level bureaucrats. In a glossary of healthy public policy routes which includes street-level bureaucrats, Crammond and Carey (2016) conclude with the following:

... our glossary demonstrates that policy is many headed. It is located in a vast array of documents, discussions dialogues and actions which can be captured variously by formal and informal forms of documentation and observation.

Effectively understanding policy and its relevance for public health requires an awareness of the full range of places and contexts in which policy work happens and policy documents are produced. (p. 4)

The literature clearly indicates feasibility in localized/bottom-up approaches to FB policy to address obesogenic environments. A secondary consideration is the quality of these localized FB policies, i.e., defining characteristics that influence their overall efficacy. The following section reviews the literature pertaining to features that may constitute high-quality policies.

High-Quality Policy Characteristics

Research suggests that effective health policies should be high-quality (i.e., strong). For example, strong smoke-free air legislation is defined as mandated, restrictive

tobacco control policies with the intent to improve public health outcomes and de-normalize smoking (Tworek et al., 2010). Substantive research shows that these strong policies have been successful in decreasing the prevalence of youth smoking (Hawkins et al., 2016; Tauras et al., 2013; White et al., 2011). One Australian study – notable for its longitudinal design – examined tobacco control policies over a 15 year period, showing lower youth smoking prevalence with stronger clean-air restrictions (White et al., 2011).

Similar outcomes come from a NYC tobacco control strategy incorporating legal action to make work-places smoke free. The use of strong, local policy had significant success over the short term in reaching public health goals, with an 11% decrease in smoking prevalence after only one year of strategy implementation (Frieden et al., 2005). Stronger policies were associated with significantly reduced smoking prevalence. The authors stated that, “During the 10 years preceding the 2002 program, smoking prevalence did not decline in New York City; within a year of implementation of the new policies, a large, statistically significant decrease occurred” (p. 1020). Strong local tobacco regulations in Massachusetts U.S., were also successful in changing adult and youth perceptions of tobacco norms. Residents from towns with strong tobacco regulations reported higher levels of anti-smoking perceptions compared to those with no strong tobacco regulations (Hamilton, Biener, & Brennan, 2007). Strong policy characteristics included, but were not limited to, policies that were mandated, restrictive, monitored and/or comprehensive. These characteristics provide a context in which policy should be more effective in achieving public health goals, as substantiated by successful tobacco control policy. The following sections will describe each of these characteristics in turn.

Mandated Policies

Mandated policies are official standards contributing to a normal part of any organization, whereas voluntary policies provide only recommendations. As such, FB policies of a mandated nature are considered preferable to voluntary ones because of their enforceability (Gardner et al., 2014). Aside from the notable study by Mendes (2008), which identified a link between a municipally mandated, legal commitment to food policy and successful policy implementation, the results of this review yielded limited literature related to mandated FB policy. This may be because mandated food policy has historically been avoided due to its perceived intrusiveness (Olstad & Ball, 2015).

These preconceived notions of the intrusiveness of FB policy are now changing, and Swinburn et al. (2011) have suggested policy-based obesity interventions are in fact much less intrusive than those for many other public health issues. In this paper – part of *the Lancet's* Obesity Series – the authors explained that policies such as those mandating the use of seatbelts enforced a specific behaviour while food policies focused on the environment, which is much less invasive of human rights. As mandated FB policy becomes more widely implemented, further pertinent research should emerge.

The shortfalls associated with voluntary policy can further the case for mandated FB policy. Numerous evidence-based examples show provincial or state-level voluntary guidelines have had an inadequate effect on the nutritional health of products available in vending specifically (Bell, Pond, Davies, Francis, Campbell, & Wiggers, 2013; Miller, Lee, Obersky, & Edwards, 2015; Olstad, Lieffers, et al., 2011; Vine et al., 2017). The general food environment in Canadian publicly funded recreation facilities shows similar findings. Olstad, Lieffers, et al. (2011) examined the impact of voluntary government-

issued guidelines on the food environment of AB recreation facilities, finding desired outcomes difficult to achieve due to the voluntary nature of the policy. In BC facilities Naylor, Bridgewater et al. (2010) and Naylor, Olstad and Therrien (2015) found that even under voluntary provincial guidelines, capacity building supports were needed for improved nutrition environments. Food industry managers from recreation facilities have also revealed that adopting provincial guidelines in their voluntary format was unlikely without either government incentive or formal legislation (Olstad, Raine, & McCargar, 2013). Of vital interest in the study by Olstad et al. (2013) was the lower adherence to voluntary nutrition guidelines in publicly funded recreation facilities with fewer resources or in areas of greater deprivation. As a result, mandated FB policies have been advocated as tools to address health inequities by ensuring individuals of all SES receive the intended benefits (Olstad & Ball, 2015).

Voluntary FB policy has also presented issues in facilitating change in Canadian schools. An analysis by McIsaac and colleagues (2015) revealed variability in adherence to the voluntary Food and Nutrition Policy for NS Public Schools. Despite this policy advising against the sale of food and beverages of a minimum nutrition rank, these foods remained on the menus of many participating schools. The evidence provided in this section supports the research-based recommendation for Canadian provinces with voluntary nutrition guidelines to “move toward mandatory healthy food procurement policies, at minimum, in settings where vulnerable populations are present” (Raine et al., 2018, p. 12). On a national level, Canada’s Healthy Eating Guidelines have also been critiqued for their limited influence on eating behaviour, in part due to their voluntary nature (MacRae, 2011).

Restrictions/Nutrition Standards within Policies

Like mandated guidelines, restrictions and nutrition standards within FB policies may also improve the food profile in obesogenic environments. A systematic review by Mayne, Auchincloss and Michael (2015) evaluated the efficacy of policy and built environment changes on obesity-related outcomes. In addition to healthier food mandates, bans and restrictions on unhealthy foods had greater effects compared with other interventions. Nutritional guidelines and/or restrictions have also been effective in achieving desired outcomes in specific settings such as schools (Cullen, Watson, Zakeri, & Ralston, 2006; Terry-McElrath et al., 2012), and hospitals (Gorton, Carter, Cvjetan, & Mhurchu, 2010; van Hulst, Barnett, Déry, Côté, & Colin, 2013). These studies indicate a positive correlation between restrictions on unhealthy food and corresponding healthier food environments.

It is also possible that stronger and/or full restrictions on unhealthy foods and beverages may be more effective than partial restrictions. Olstad, Goonewardene et al. (2015) found that increasing availability of healthy items only in a community sport setting was insufficient for influencing healthy choices by most customers. Other research suggests that a greater impact would occur with stronger restrictions or nutrition standards targeting unhealthy foods and beverages. For example, a rigorous systematic review of food and beverage policies in schools revealed three studies which showed decreased unhealthy food consumption by students and decreased availability of unhealthy foods as a result of school policy nutrition standards (McKenna, 2010). These restrictions differed based on level of legislated mandate, stringency, and adherence criteria. In a more recent review of food policies incorporating evidence from

psychology, economics, and public health nutrition, Hawkes and colleagues (2015) concluded that partial restrictions on unhealthy foods had limited success in improved child health outcomes because children remained exposed to unhealthy options. More support for stronger FB policy restrictions comes from Chicago's 100% healthy option vending initiative, which used strict vending contract guidelines in accordance with specific nutrition criteria. These stringent standards resulted in improved availability of healthy food in public parks and the researchers projected this would have a profound effect on children (Mason, 2014). Overall, the literature suggests that nutrition standards are an important part of FB policy, with outcomes varying by level of restriction.

Despite the considerable evidence supporting full restrictions on unhealthy foods, initiatives that simply reduce unhealthy food product availability have demonstrated efficacy in three major Australian hospital sites (Boelsen-Robinson, Backholer, Corben, Blake, Palermo, & Peeters, 2017). This study examined the long-term impacts of healthy vending machine policies within these settings using a strong mixed-methods design that incorporated time-series data collection over the course of three years and stakeholder interviews. The researchers reported positive health outcomes due to the significantly decreased sales of the unhealthiest vending machine products (55.7%).

Nevertheless, further research is needed to determine the efficacy associated with various levels of nutrition standards and/or restrictions. Some researchers have suggested that it may be suitable for FB policy to become increasingly restrictive over time; allowing time to gain policy support and become integrated into the food environment (Olstad, Lieffers et al., 2011). Progressive strengthening of healthy public policies is a strategic approach effectively used for tobacco control. For example, local US tobacco

policies showed success when policy components were chosen based on anticipated resistance in each community: providing weaker policies with the potential to become more rigorous overtime (Satterlund et al., 2011b). This suggests that the initial strength of FB policies may also be best if initially tailored to each setting, with the potential for increased strength.

On the other hand, Sanders-Jackson, Gonzalez, Zerbe, Song and Glantz (2013) examined the strength of US state and local-level smoking laws in various settings, using a range from no law to 100% smoke-free. The number of laws increased from 1970 to 2009; however, the strength of laws remained largely unchanged. In contrast to the argument for eventual policy strengthening, these researchers recommended enforcing strong tobacco control laws at the outset.

Comprehensive Policies

Another characteristic contributing to high-quality FB policy is comprehensiveness: i.e., ensuring a policy encompasses all elements of the food environment. Cullen et al. (2006) found that despite the success of a restrictive policy in changing the food offered at school snack bars, students continued to acquire banned, unhealthy food and beverages from other sources such as vending machines. The researchers concluded that more effective policy would be comprehensive, to eliminate access to all unhealthy food sources. Similarly, Jaime and Lock (2009) suggested food policies should be implemented as a comprehensive, whole-diet approach that considers all food sources accessible by children.

Monitored Policies

Policy monitoring is also considered a crucial component of policy quality and effectiveness (McPherson & Homer, 2011; L'Abbé et al., 2013), as reinforced by Tobacco policy experiences. Satterlund et al. (2011a) examined the barriers in adopting and implementing outdoor smoke-free policies in Californian recreational and community spaces, finding that enforcement was an imperative component for successful policy implementation and adoption.

Available evidence also supports monitoring for FB policy specifically to reach desired public health outcomes. In an editorial on policies targeting unhealthy food consumption in children, Olstad and Ball (2015) detailed that without a monitoring system, food policy adherence would be insufficient and thus nutrition outcomes would remain unchanged. School based research by Orava, Manske and Hanning (2016) examined the impact of a provincial school policy which set nutritional standards for food and beverage sales in Ontario, Canada. The researchers postulated that significantly limited policy compliance was the result of school confusion about who was accountable for policy monitoring. External to Canada, a critical analysis of non-communicable disease control policies in Bangladesh revealed lack of monitoring and policy enforcement as a key barrier to successful policy implementation (Biswas, Pervin, Tanim, Niessen, & Islam, 2017).

Substantive research suggests that policies with high-quality characteristics are associated with greater efficacy in achieving desired public health outcomes (Hamilton et al., 2007; Hawkins et al., 2016; McPherson & Homer, 2011; Olstad & Ball, 2015; Tauras et al., 2013; White et al., 2011). As a result, the results of this literature review support

the conclusion that policies with high-quality characteristics will also be most effective in changing obesogenic environments. These policy features may include mandates, restrictions, nutrition standards, comprehensive in nature, and a monitoring component.

Types of High-Quality FB Policies

The last FB policy feature examined in this literature review is the specific method employed to initiate desired change. A variety of FB policy tools are available to improve obesogenic environments. According to Lobstein et al (2015), food policy tools include nutrition standards, financial incentives or disincentives, marketing regulation, and control of public-sector purchasing. The policies principally highlighted to reduce soft drink consumption specifically, are taxation and vending machine restrictions (Fletcher, Frisvold, & Tefft, 2010).

The first recommendation – taxation – has had longstanding success in tobacco and alcohol control (WHO, 2016), and aligns with the increasing interest and research with the feasibility of fiscal nutrition policies (Wright, Smith, & Hellowell, 2017). Merit for this policy tool derives from substantial evidence of an association between fiscal policies and reduced unhealthy food and beverage consumption, and consequently better health outcomes. A meta-analysis examining the impact of SSB prices on quantitative obesity-related outcomes showed that all relevant studies (9 with a longitudinal or cross-sectional design) suggested lower consumption of SSB with higher taxation (Escobar, Veerman, Tollman, Bertram, & Hofman, 2013). The researchers hypothesize that these outcomes “may lead to modest reductions in weight in the population” (p. 10). In a systematic review with a much larger sample that incorporated studies, reviews and/or predictive models, Niebylski, Redburn, Duhaney and Campbell (2015) found moderately-

strong evidence of improved healthy food consumption and body weight outcomes (i.e. body mass index or blood pressure) associated with unhealthy food taxation. However, this review also revealed a limited number of relevant experimental studies (n=10) and the researchers reported inadequate demographic representation as a limitation within all these studies. A more recent systematic review found mixed results of nutrition taxes and health impacts (Wright et al., 2017). These researchers noted that many studies are based on potential policies and recommended more research examining the many real fiscal nutrition policies that exist internationally.

Also notable is that the implementation of fiscal nutrition policies are often accompanied with numerous barriers such as lack of political support or approval, presence of political resistance, and lobbying by the food industry (Niebylski et al., 2015; Wright et al., 2017). Health taxes are further criticized due to the potential for regressive impacts, consumer substitution with unhealthy options, and insignificant effects with low taxation (Fletcher et al., 2010; Wright et al., 2017). Due to these broader societal level policy challenges, researchers have endorsed prioritizing food policies which target specific environments (Lobstein et al., 2015). Raine (2005) suggested that improving obesogenic environments by increasing access and availability of healthy foods will facilitate the potential for healthy eating. More recently, Lobstein et al. (2015) provided research-based advocacy for promoting healthier food choices by improving a setting's food options. Hence, vending machines restriction which facilitate healthier food and beverage profiles – the alternate policy approach proposed by Fletcher et al. (2010) – may be more feasible. To accomplish this, a bottom-up method is available through

modifying vending machine contracts to ensure healthier offerings (i.e., healthy vending contracts).

Healthy Vending Contracts

Although healthy vending contracts may seem like an unconventional obesity-policy tool, Satterlund et al. (2011b) suggested that policies take a variety of formats, and are developed and implemented by various decision makers. Healthy vending contracts also appear to be an efficacious FB policy approach. A systematic review of healthy vending initiatives provided rigorous evidence that increased availability of healthier choices in vending led to increased sales of healthy products and maintained profits (Grech & Allman-Farinelli, 2015). Further, a study examining vending in Iowa U.S. worksites, found the most substantial increases in healthy vending item availability occurred where an explicit agreement was made with the vendor to replace unhealthy products (Lillehoj, Nothwehr, Shipley, & Voss, 2015). Hence, vending contracts may be a feasible approach to improve the health profile of vending machines.

A key benefit of healthy vending contracts is that they naturally offer various opportunities to incorporate the previously mentioned high-quality policy characteristics. As a formal, legal strategy to improve nutritional quality of foods and beverages (Ashe et al., 2007), vending contracts are mandated by nature. Other high-quality characteristics potentially addressed by school vending contracts included descriptions of products permitted for sale, profitability, district control, district enforceability, the district's right to audit, monitoring to ensure compliance, and positive working relations with vendors (Ashe et al., 2007). As for comprehensiveness, vending machines encompass only one

element of most food environments, but they may set precedence for a more comprehensive approach.

Vending contracts are also a formal agreement between a representative from the setting and the vendor; thus, representing a bottom-up, street-level bureaucratic policy approach. This fosters an opportunity to lessen control from suppliers whose primary interest is seldom consumer health. This is important considering a longitudinal study of U.S. schools found an association found between supplier involvement with vending policies and an increased availability of unhealthy foods (Terry-McElrath, Hood, Colabianchi, O'Malley, & Johnston, 2014). The researchers recommended that while schools must work with vending suppliers, they must also limit their influence on product choice.

The localized nature of healthy vending contracts may also offer numerous advantages compared to higher levels of policy. According to research by Olstad, Lieffers and colleagues (2011), the most feasible means of Alberta's (AB) provincial nutrition guideline implementation in a recreation facility was through applying the guidelines in a renewed food service contract. Another study examining school adherence to provincial nutrition guidelines in Ontario (ON) and AB found that vending machines in majority of schools were non-compliant with provincial nutrition standards (Vine et al., 2017). The authors highlighted the need for information and tools which may support provincial nutrition policies. Healthy vending contracts may function as such a tool, initiating desired changes at a closer level.

Similar findings have emerged when examining the impact of state-level FB policy on vending machines in Australian health-service facilities. A state-wide FB

policy mandating the removal of unhealthy food from vending in one Australian state was regarded as ineffective when unhealthy food items continued to be made available in vending (Miller et al., 2015). Another state revealed limited success of state-level policy in improving the health profile of vending in health care facilities, particularly for food. Vending audits revealed a 29% increase in availability of healthy beverages, and only 1% of healthy foods. The researchers suggested that existing supplier contracts impeded greater policy implementation. They recommended state-wide nutrition standards be applied to vending contracts for further improvement (Bell et al., 2013).

On the other hand, Boelsen-Robinson et al (2017) deemed Australian state government guidelines successful in improving the health profile of food and beverages in health services. The findings revealed improvements in all food areas, including vending, due to increased availability of healthier options and decreased availability of unhealthiest options. The state-wide nutrition guidelines were considered an impetus for healthy vending contract implementation. Other Australian researchers declared that increased improvements may be made by applying state-wide nutrition standards to vending contracts during renewal (Bell et al., 2013). This suggests that regardless of Canadian evidence showing the lack of success of provincial guidelines, they may serve as a platform for developing healthy vending contracts.

One study from the healthy vending literature stands out as an exemplary model for the development and implementation of healthy vending contracts. A pediatric hospital in Montreal, Canada, replaced standard vending machines with health promoting vending machines (HPVM) which contained healthy food and beverages as per strict nutrition criteria. Vending purchasers reported increased levels of satisfaction, and

increased levels of importance assigned to health-related nutrition factors (van Hulst et al., 2013). These findings confirm the acceptability and feasibility of healthy vending and are potentially generalizable to vending machines in other settings. Also notable is that these positive changes actualized despite the continuation of some unhealthy vending within the hospital due to contractual obligations. As vending contracts come up for renewal, healthy vending contracts may emerge as part of transitioning to a healthier food environment.

The use of contracts to control vending product availability is not new, although historically they promoted the sale of unhealthy consumables. These policies, known as pouring rights contracts, granted exclusive selling privileges to food and/or beverage companies in exchange for a lump sum and further financial advantage (Nestle, 2000). Pouring rights contracts used to be commonplace in schools, and the resulting school environment hosted unhealthy vending products, which evidence shows promotes unhealthy consumption (Almeling, 2003; Nestle, 2000; Price, Murnan, & Moore, 2006). Despite the moral and ethical dilemma of pouring rights contracts, school administrators in charge of such policies have been understandably swayed by the financial incentives (Nestle, 2000; Opalinski, 2006).

School vending has been critiqued for having poor regulation and products of low nutritional value, perhaps due to abundant pouring rights contracts. Ashe and colleagues (2007) postulated that improving school vending contracts to promote healthier options may improve the health of communities. They stated, “because vending contracts are the primary legal mechanism by which unhealthy foods and beverages are brought on to

school property, they are the obvious means by which schools can move quickly to improve the nutritional quality of competitive foods and beverages” (p.140).

A specific setting where the use of healthy vending contracts may be valuable is publicly funded recreation facilities. Interest in the health profile of these environments is increasing due to recognition of their obesogenic environments concurrent with evidence of poor dietary consumption in children. The research examining the food environment in this prominent public setting has taken place primarily in Canada and in Australian sport settings. The remainder of this literature review uses this evidence to explain how healthy vending contracts may contribute to addressing an emerging public health issue in Canada – obesogenic publicly funded recreation facility environments.

Obesogenic Publicly Funded Recreation Facilities

To date, many Canadian publicly funded recreation facilities have unhealthy food and beverages readily available to patrons (Chaumette et al., 2008; Naylor, Bridgewater, et al., 2010; Thomas & Irwin, 2010). Facilities in the Canadian province BC were labelled as obesogenic following audits of their food environments (Naylor, Bridgewater, et al., 2010). This is a public health concern because it encourages unhealthy food choices by facility patrons and visitors, including children. A case study in the Canadian province of AB reported approximately 50% of facility patrons were under the age of 18 (Olstad, Lieffers, et al., 2011). Furthermore, children often consume food and beverages purchased in this setting, as evidenced by research revealing 80.5% of patrons purchasing food in an ON facility did so primarily for their children (Thomas & Irwin, 2010).

Schools have been at the forefront of childhood obesity interventions due to the large amount of time children spend there (PHAC, 2011); and the opportunity this setting

offers to reach many children (WHO, 2016). School-based initiatives have been largely successful in improving food environments (Niebylski et al., 2014; Orava et al., 2016; Schwartz et al., 2017); however, we know that further establishing healthy foods as the norm requires healthier food environments in other settings that children frequent (Olstad, Goonewardene, et al., 2015).

The association (moderately strong) between the broader community context and children's diets (Engler-Stringer, Le, Gerrard, & Muhajarine, 2014) reinforces the research showing that healthy food environments in schools do not prevent children from acquiring unhealthy products in other settings. Olstad, Raine and McCargar (2012) observed that students would visit a nearby recreation centre to purchase unhealthy food items banned at their school. In the U.S., schools with vending machine restrictions had no difference in student soft drink consumption compared to those without due to accessible sources of restricted beverages outside the school (Fletcher et al., 2010). Similar findings in Canada showed that the food retailer environment within 1 km surrounding schools had a powerful influence on purchasing patterns (Browning, Laxer, & Janssen, 2013).

To contribute to community-wide efforts to reduce childhood obesity prevalence, obesity interventions should be implemented in publicly funded recreation facilities – a community setting where children spend a substantial amount of time outside of school (Naylor, Bridgewater, et al., 2010). Accordingly, the WHO (2016) has suggested that school-based efforts be reinforced by healthy food and beverage initiatives in community settings, including children's sports facilities. It is apparent that the overall community

must be supportive of healthy changes to effectively reach the public health goal of reversing childhood obesity trends.

In addition to threatening child health and undermining school-based obesity initiatives, the obesogenic status of publicly funded recreation facilities contradicts their mandate to promote public health and wellness. Ashe, Graff and Spector (2011) asserted the responsibility of local governments to ensure that recreational facilities not only promoted physical activity, but also provided healthy food. Physical activity, recreation, and sport are core functions of publicly funded recreation facilities; however, the obesogenic food environment detracts from their overall purpose of enhancing well-being. This may not go unmissed by patrons; parents reported that health promotion messages in sports settings were weakened by unhealthy dietary choices (Kelly, Chapman, King, Hardy, & Farrell, 2008). The paradox between a presumed health promoting setting and the provision of unhealthy food and beverages has also been cited in public parks (Mason, 2014); health care facilities (Boelsen-Robinson et al., 2017); schools (Almeling, 2003; Gemmill & Cotugna, 2005; Price et al., 2006); and sport venues (Kelly et al., 2008).

There are substantial, pressing reasons to improve the health profile of publicly funded recreation facilities, and the next step is determining how to best accomplish this. Consistent with tobacco policy experience, public health researchers strongly encouraged policy-based approaches (Olstad, Downs, et al., 2011). This is supported by a systematic review of food environments in sports settings which revealed an association between healthy FB policy and increased availability of healthy products (Carter, Edwards, Signal, & Hoek, 2012). This review was based on a sample of international studies which

suggests broad applicability. However, the sample was also relatively small (N=14) and many studies had methodological limitations. The researchers recommended further research examining this important topic and the influence on children's diets (Carter et al., 2012).

Unfortunately, a deficit of FB policy in Canadian publicly funded recreation facilities was demonstrated by Naylor, Bridgewater and colleagues (2010), who found 88% of BC recreation facilities under analysis had no healthy FB policy guiding food sales. This study cited FB policy as an important part of increasing availability of healthy options. A further pilot project revealed lack of supportive FB policy as a barrier to improving the health of publicly funded recreation facility environments in numerous BC communities (Naylor, Vander Wekken, Trill, & Kirbyson, 2010).

Despite low reported numbers, it is promising that some Canadian municipalities have developed and implemented FB policies for recreation facilities, such as Hamilton ON's "Healthy Nutritional Environments in City Recreational Facilities" (2006) policy, which clearly details specific nutrition requirements. Voluntary guidelines also exist in the provinces of BC, AB and Nova Scotia (NS), which set direction for the nutrition profile of corresponding publicly funded recreation facilities (more broadly targeted at public buildings in BC and applied to municipal facilities). While the provincial guidelines have initiated momentum in supporting healthy change in the food environment of publicly funded recreation facilities (Olstad, Downs, et al., 2011; Olstad, Lieffers, et al., 2011; Vander Wekken, Sørensen, Meldrum, & Naylor, 2012), further effort is needed, and may be achieved via healthy vending contracts.

Healthy Vending Contracts in Publicly Funded Recreation Facilities

Similar to schools, vending machines are one route through which publicly funded recreation facilities expose children to foods and beverages (Ashe et al., 2011), and the unique position of recreational facilities to improve food services via vending contracts has already been expressed by researchers (Olstad et al., 2012). Other research has confirmed that recreation facilities with healthy vending contracts had greater availability of healthy choice products in vending (Naylor, et al., 2015; Naylor, Vander Wekken, et al., 2010; Olstad, Raine, & McCargar, 2012). It is also noteworthy that street level bureaucrats in this setting (i.e., facility managers, administrators or other staff) have control of vending contracts, for example, in schools where principals have been reported as primarily responsible for vending machine policies (Gemmill & Cotugna, 2005).

A case study from Chicago demonstrated the successful use of vending contracts to improve the food environment in a comparable setting – state parks. In this example, the state park district and a national vendor entered a five-year snack vending contract mandating 100% healthy options in adherence to specific nutrition standards. The initiative was exceptionally successful, leading to improved food environments, increased revenues, and positive reactions and acceptability by both staff and visitors. What is more, the success of the initial snack contract led to a healthy beverage vending contract (Mason, 2014).

Summary

The current global childhood obesity epidemic alongside persistent negative statistics relating to unhealthy food consumption in Canadian children, is a serious modern-day issue. Obesogenic environments contribute to this unhealthy food

consumption and consequently can have adverse health repercussions. It appears that like tobacco control efforts, FB policy may be effective in improving the health profile of these environments and social norms, which may ultimately contribute to the public health goal of reversing childhood obesity trends.

The obesogenic status of publicly funded recreation facilities undermines current obesity interventions, contributes to unjust health inequities, exposes children to unhealthy food and beverages and contradicts facility mandates. A small body of research indicates that high-quality FB policy in the form of healthy vending contracts established at the 'street-level' by decision-makers within these settings, may facilitate effective change (Naylor et al., 2015; Naylor, Vander Wekken, et al., 2010; Olstad et al., 2012). The purpose of this manuscript style thesis is to enhance the evidence base about healthy vending contracts as a FB policy route for publicly funded recreation facilities. The results and analysis have the potential to provide direction to not only recreation facilities, but also policy makers seeking to improve other nutrition environments.

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Chapter 2: Manuscript

Introduction

According to a recent nationwide report, a majority of Canadian children are not consuming healthy diets, with high levels of sugar-sweetened beverage consumption and inadequate fruit and vegetable intake (Rao, Kropac, Do, Roberts, & Jayaraman, 2017). This is concerning considering the association between unhealthy food consumption and childhood obesity – a global health epidemic with numerous unfavorable individual and societal repercussions (Public Health Agency of Canada [PHAC], 2011; World Health Organization [WHO], 2016). Past obesity interventions typically focused on individual behavior change to promote healthy eating; however, it is now understood that the environment is profoundly influential on behavior (Alvaro et al., 2011; Raine, 2005; Roberto et al., 2015; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008; Taylor, Evers, & McKenna, 2005; Traverso-Yepetz & Hunter, 2016). As a result, recommendations from the WHO (2016) and researchers (Raine et al., 2018; Roberto et al., 2015; Traverso-Yepetz & Hunter, 2016) have redirected the focus of obesity interventions to incorporate environments in which individuals, including children, spend their time.

Environments believed to have a negative effect on obesity-related behaviours have unhealthy foods and beverages highly available, affordable and normalized – i.e., obesogenic (WHO, 2016). Children are especially at risk in these settings due to the limited control they have over the causal mechanisms of unhealthy behaviour (WHO, 2016) regardless of parental supervision (Lobstein et al., 2015). In addition, the link between the nutrition environment and health disparities (Glanz, Sallis, Saelens, & Frank,

2005) suggests that obesogenic environments may also inequitably impact individuals of low socioeconomic status (SES) providing an ethical impetus for change.

While an array of possible interventions exist, food and beverage (FB) policy has been highlighted as an effective mechanism of change (Di Noia & Prochaska, 2010; Hawkes et al., 2015; Raine et al., 2018; Schwartz, Just, Chiqui, & Ammerman, 2017). Policy-based obesity interventions have numerous strengths, including their enduring, population-wide effect, ability to change default behaviours and to modify necessary features of the environment (Swinburn et al., 2011). Researchers have also suggested that FB policy has the potential to address inequalities in diet quality (Drewnowski, 2009) and contribute to healthy eating preferences in children and youth (Schwartz et al., 2017). Furthermore, FB policies may facilitate lasting change by establishing healthy social norms (Raine et al., 2018; Schwartz et al., 2017) as exemplified by tobacco control policy (Hawkins, Bach, & Baum, 2016; Satterlund, Cassady, Treiber, & Lemp, 2011a; 2011b; White et al., 2011).

Despite recognized need for government action in FB policy (Crammond et al., 2013; PHAC, 2011; Raine et al., 2018; Schwartz et al., 2017; Swinburn et al., 2011), it has largely been ignored at the national level in Canada (MacRae, 2011; Mendes, 2008). Further, existing provincial guidelines have been insufficient in improving healthy food and beverage availability in numerous settings (McIsaac, Shearer, Veugelers, & Kirk, 2015; Olstad, Downs, Raine, Berry, & McCargar, 2011; Olstad, Lieffers, Raine, & McCargar, 2011). Governments may face challenges in this higher level policy arena due to elections, differing opinions of numerous stakeholders, diverse political ideologies, and competition from other government priorities (Ashe, Graff, & Spector, 2011;

MacRae, 2011; Rose & Cray, 2010; Sisnowski, Street, & Braunack-Mayer, 2016). As a result, reversing childhood obesity trends may require action from community-level government and non-government sectors (PHAC, 2011; WHO, 2016).

This study examines such a community-level FB policy approach enacted by bureaucrats in community level public sector facilities/environments: healthy vending machine (vending) contracts. Contracts are the direct legal means through which modifications to vending products may be made (Ashe et al., 2007). Historically, the profit-driven food and beverage industry capitalized on this by using vending contracts to promote the sale of primarily unhealthy consumables (Nestle, 2000). Alternatively, health stipulations within vending contracts may promote the sale, consumption and normalization of healthy foods and beverages.

Evidence indicates a link between health stipulations and healthier food environments in schools (Cullen, Watson, Zakeri, & Ralston, 2006; Raine et al., 2018; Terry-McElrath, O'Malley, & Johnston, 2012), hospitals (Gorton, Carter, Cvjetan, & Mhurchu, 2010; van Hulst, Barnett, Déry, Côté, & Colin, 2013), and public parks (Mason, 2014). In fact, a systematic review of 18 studies (six with a large sample size) revealed a profound effect on nutrition and diet resulting from bans and restrictions on unhealthy foods compared with interventions that simply warned individuals of unhealthy choices, such as nutrition labeling (Mayne, Auchincloss, & Michael, 2015). Numerous studies have also linked official, localized healthy vending initiatives with significant improvements in the health profile of vending – i.e., increased healthy options and/or decreased unhealthy options (Bell et al., 2013; Boelsen-Robinson, Backholer, Corben, Blake, Palermo, & Peeters, 2017; Brooks et al., 2017; Lillehoj, Nothwehr, Shipley, &

Voss, 2015; Mason, 2014; Naylor, Olstad, & Therrien, 2015; Naylor, Vander Wekken, Trill, & Kirbyson, 2010; Olstad, Raine, & McCargar, 2012; van Hulst et al., 2013). A recent synthesis of five studies including two randomized control trials with a low risk of bias, provided further evidence of increased sales of healthy products and maintenance of profits following improved availability of healthier vending products (Grech & Allman-Farinelli, 2015).

Healthy vending contracts could be considered a bottom-up approach enacted by local decision makers. This is reflective of ‘street level bureaucracy’ – where decision makers closest to the targeted environment engage in action that facilitates the development of context-specific policies with increased applicability and acceptability (May & Winter, 2009; Tummers & Bekkers, 2014). Bottom-up approaches have been successful for various food policies (Brooks et al., 2017; Mendes, 2008; Sisnowski et al., 2016), and tobacco control policies tailored to local contexts (Rhoades, Beebe, Boeckman, & Williams, 2015; Satterlund et al., 2011b).

Importantly, healthy vending contracts are likely a necessary step to insure the full implementation of higher level FB policies, such as provincial nutrition guidelines. Research revealed that guidelines in Alberta (AB) were more likely to be adopted in recreation facilities with existing nutrition policies (Olstad, Downs, et al., 2011), and food service contracts, specifically, were reported as the most feasible means of implementing these provincial guidelines (Olstad, Lieffers, et al., 2011). Furthermore, conventional vending contracts have been cited as a barrier to higher level FB policy implementation (Bell et al., 2013; Naylor et al., 2015; Naylor, Vander Wekken, et al., 2010; Olstad, Raine, & McCargar, 2012). These are important findings considering

provincial nutrition guidelines have been largely ineffective in achieving nutrition goals (McIsaac et al., 2015; Naylor et al., 2015; Olstad, Downs, et al., 2011; Olstad, Lieffers, et al., 2011; Olstad, Raine, & McCargar, 2012).

Despite the suggested impact of healthy vending contracts on nutrition environments, Fletcher, Frisvold and Tefft (2010) posited that vending machine restrictions alone will not lead to meaningful changes in childhood obesity due to the continued presence of unhealthy products in the broader food environment. Regardless, healthy vending has a role to play in changing obesogenic environments and promoting improved behaviours and social norms. According to Ashe and colleagues (2011), improved availability of healthy choices in vending machines changes the status quo related to healthy food.

Several studies have alleviated concerns about stakeholder responses to healthy vending. Positive consumer feedback regarding healthier vending indicated increased acceptability and normalization (Bell et al., 2013; Carrad, Louie, Milosavljevic, Kelly & Flood, 2015; Mason, 2014; van Hulst et al, 2013); and a survey from two universities and a public hospital revealed 80% of respondents were willing to pay equal or greater amounts for healthy vending products (Carrad et al., 2015). Moreover, the food and beverage industry is reportedly making healthier changes such as food reformulation, improved labeling, and responsible marketing (Vander Wekken, Sørensen, Meldrum, & Naylor, 2012; van Hulst et al., 2013; Yach et al., 2010). These healthy trends indicate increasing acceptability and changing social norms (Ashe, Graff, & Spector, 2011; Schwartz et al., 2017), and present a distinct opportunity for healthy vending contracts.

Obesogenic Publicly Funded Recreation Facilities

Canadian publicly funded recreation facilities have been recognized as typically providing unhealthy food and beverage environments (Chaumette, Morency, Royer, Lemieux, & Tremblay, 2008; Naylor, Bridgewater, Purcell, Ostry, & Vander Wekken, 2010; Thomas & Irwin, 2010). Obesogenic publicly funded recreation facilities are problematic for several reasons; a) vending is a prominent feature within this setting (Ashe et al., 2011; Naylor, Bridgewater, et al., 2010; Olstad, Raine, & McCargar, 2012), b) perhaps most pertinently many patrons visiting this setting are children (Naylor, Bridgewater, et al., 2010; Olstad, Lieffers, et al., 2011; Thomas & Irwin, 2010), c) the unhealthy consumables in recreation facilities contradict their mandate to promote wellbeing, and d) it seems important to align healthy food promotion with the promotion of health related physical activity (Ashe et al., 2011).

Obesogenic recreation facility food environments may also undermine efforts in other settings. For instance, schools have been at the forefront of addressing obesogenic environments through policy action (Niebylski et al., 2014; Orava, Manske, & Hanning, 2016; Schwartz et al., 2017) but substantial research revealed that children will acquire unhealthy foods and beverages available in settings outside of the school (Browning, Laxer, & Janssen, 2013; Engler-Stringer, Gerrard, & Muhajarine, 2014; Fletcher et al., 2010; Olstad, Lieffers, et al., 2011; Olstad et al., 2012). As such, the WHO (2016) has suggested that school-based healthy food and beverage efforts be reinforced in children's sports facilities. This is supported by a systematic review highlighting the association between healthy FB policy and increased availability of healthy products in sport settings (Carter, Edwards, Signal, & Hoek, 2012).

Unfortunately, very few publicly funded recreation facilities have reported having FB policies in place. In 2006, 12% reported having a FB policy in a sample of British Columbia (BC) facilities (Naylor, Bridgewater, et al., 2010) and in 2009, 19% in a sample of AB facilities (Olstad, Downs, et al., 2011). Research indicates that provincial guidelines have contributed to healthier food environments in recreation facilities (Olstad, Downs, et al., 2011; Olstad, Lieffers, et al., 2011; Vander Wekken et al., 2012); however, their success is reportedly limited, with no facilities achieving guideline levels of healthy products (Naylor et al., 2015; Olstad, Lieffers, et al., 2011; Olstad, Raine, & McCargar, 2012), and there are numerous barriers to implementation and/or adherence cited (Naylor et al., 2015; Olstad & Ball, 2015; Olstad, Lieffers, et al., 2011; Olstad, Raine, & McCargar, 2013). Alternatively, a more localized capacity-building approach designed to support provincial guideline implementation in BC recreation facilities significantly improved the ‘health profile’ of vending products (Naylor et al., 2015; Naylor, Vander Wekken, et al., 2010), and studies have highlighted the importance of healthy vending contracts specifically (Boelsen-Robinson et al., 2017; Brooks et al., 2017; Naylor et al., 2015; Naylor, Bridgewater, et al., 2010; Naylor, Vander Wekken, et al., 2010; Olstad, Raine, & McCargar, 2012).

Research Purpose and Objectives

The purpose of this study was to contribute to the evidence base about healthy food and beverage vending contracts as a form of FB policy in Canadian publicly funded recreation and sport facilities. The primary research objective was to determine whether the health profile of vending products (measured using proportions of products categorized as sell most, sell sometimes and do not sell within the 2014 Healthier

Choices in Vending Machines in BC Public Buildings product categories) sold in facilities with health stipulations in their vending contracts was significantly better than that in facilities without health stipulations in their vending contracts. Healthy vending contracts were considered a legal written agreement between the facility and the food and/or beverage vendor, which at minimum included a stipulation about the general health qualities of the products sold. Ideally, these contracts included restrictions on the type of products sold in vending. It was hypothesized that facilities with healthy vending contracts would have significantly healthier product profiles in their vending machines.

A secondary research objective was to examine the impact of policy quality on the health profile of vending. Policy quality was examined using two features. The first quality feature was specificity. A higher quality policy was considered to be one with specific stipulations around the amount of food allowed from any one category (e.g., sell sometimes) rather than simply mentioning health in the contract. The second policy quality feature was strength and it was rated based on the presence or absence of monitoring and accountability (i.e., when it would be measured and by whom). Based on previous evidence (Hamilton, Biener, & Brennan, 2007; Hawkins et al., 2016; McPherson & Homer, 2011; Olstad & Ball, 2015; Tauras, Huang, & Chaloupka, 2013; White et al., 2011), it was hypothesized that more specificity and/or strength in the stipulations would result in significantly higher quality vending contracts.

Methods

Research Design

This study was conducted using data from the broader Eat, Play, Live (EPL) initiative: a nutrition policy intervention study to examine the impact of nutrition

guideline implementation in recreation facilities across three Canadian provinces –BC, AB, and Nova Scotia (NS). Specifically, EPL is examining the impact of provincial guidelines on food environments in recreation facilities that receive no additional capacity building versus those with capacity-building supports (e.g., provincial coordinator support, seed funding grants, suggested individualized plans, necessary information for action), and compared to those in a non-guideline province, Ontario (ON). It is utilizing a randomized comparison trial with a wait-list comparison condition and pre/post measures of the food environment (see Figure 1).

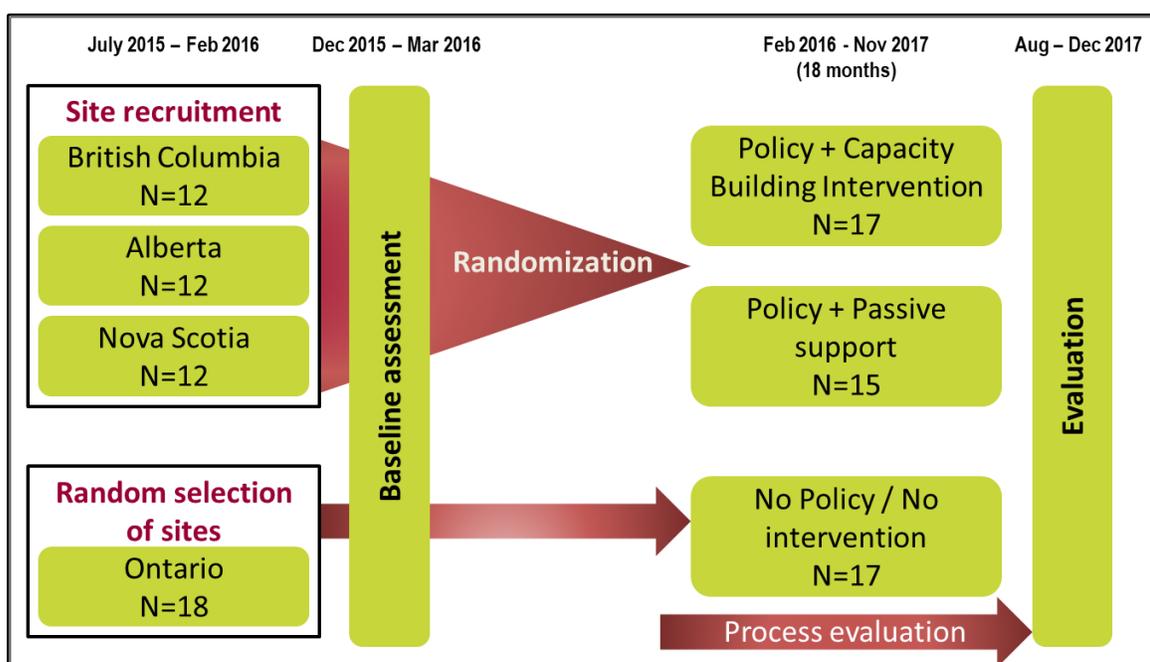


Figure 1. EPL research design and timeline

Data for this study were derived from the EPL baseline assessment in December 2015 – March 2016. There are numerous aspects of the food environment within publicly funded recreation facilities (see Figure 2), but this research focused specifically on vending.

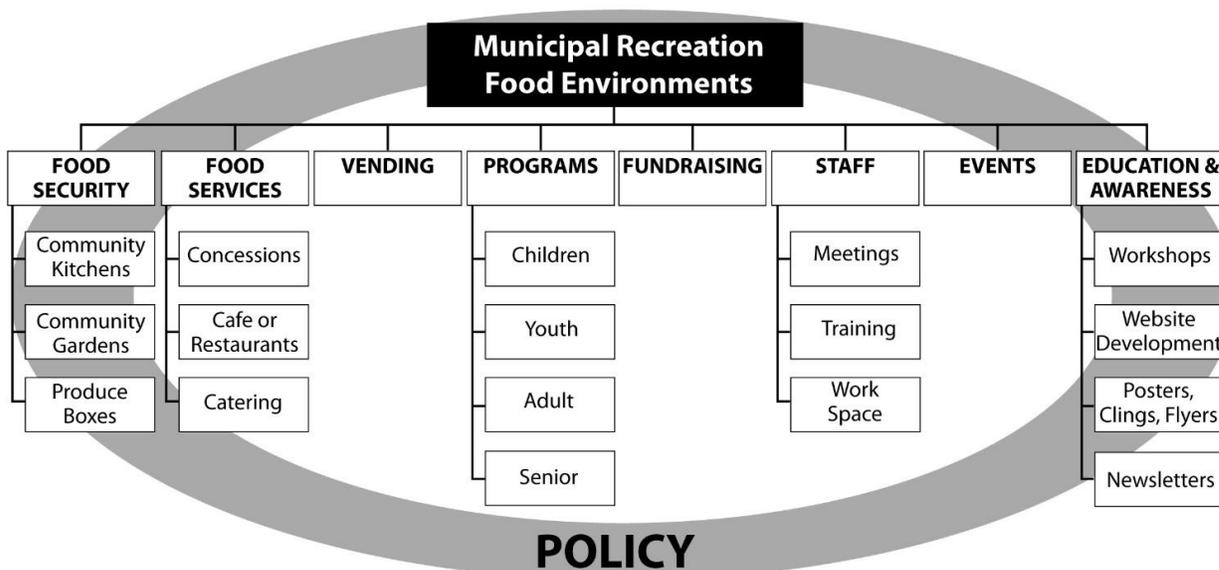


Figure 2. A model describing elements of the food environment in publicly funded recreation facilities where opportunities for healthy food and beverage initiatives are present. Adapted from Naylor, Bridgewater et al. (2010). Copyright by the *International Journal of Environmental Research and Public Health*. Reprinted with permission.

Ethics Statement

Harmonized ethics approval from University of Victoria and University of British Columbia was granted with the UVIC Human Research Ethics Board (HREB) as the Board of Record (BC 15-196).

Participation

The baseline data for EPL were taken from 49 Canadian publicly funded recreation facilities across four provinces; BC (n=14), AB (n=11), ON (n=17), and NS (n=7). Facilities were included in the sample if they met the eligibility criteria (see Appendix A), which included not having made changes to the health profile of their food services in the last five years. Facility directors were recruited by e-mail and follow-up phone calls. Once a Director indicated that their facility would participate, staff were

involved in facilitating data collection and intervention (if they were randomly assigned to the intervention condition) and recruited to participate in follow-up interviews. Of the 49 facilities recruited for the broader EPL research, only facilities with vending machines (N= 46) were included in this vending-focused sub-study.

Data Collection

Vending audits. To assess the health profile of vending machine products, standardized audits were conducted and included recording product elements such as brand, product, variety/type, size, flavor and price using standardized forms and definitions. This vending audit procedure had high inter-rater reliability (product description, $r=.97$; product lists, $r=.88$; product profiles, $r=.95$); as well as high repeat reliability in snack and beverage vending over a 10-day period ($r= 1.0$, $r=.97$) (Naylor, Vander Wekken, et al., 2010).

Snack and beverage vending machines were inventoried and assigned numbers and locations in each facility. Following the inventory, a maximum of two snack and two beverage machines were randomly selected for auditing. Members of the EPL research team visited participating facilities in each province and generated a detailed product list for each vending machine with the standardized audit form.

Listed products and their descriptions were then categorized using a standardized packaged food categorization tool (the BC Brand Name Food List; Dietitians Service) based on the provincial guidelines for Healthier Choices in Vending Machines in BC Public Buildings (2014). These guidelines were used to harmonize the outcomes for cross-province analysis, although there are differences in the guideline product stipulations across jurisdictions (Olstad, Poirier, Naylor, Shearer, & Kirk, 2015). The BC

provincial guideline (2014) categories and product quality guidelines can be found at <https://www2.gov.bc.ca/assets/gov/health/managing-your-health/healthy-eating/vending-policy-2014.pdf>. The three snack and beverage categories within these guidelines are currently described as: Sell Most (SM), Sell Sometimes (SS), and Do Not Sell (DNS). SM are healthier options that have greater amounts of essential nutrients and lower sodium, sugar and fat content; SS products also provide essential nutrients but have higher sodium, sugar or fat content; and DNS are less nutritious due to greater fat, sodium and/or sugar content. The final counts for each category were converted into percentages to account for differing number of slots between vending machines.

Vending contracts. Vending contract information was collected by telephone interview or e-mail questionnaire with staff representatives. These asked about details related to all food and vending services within facilities (see Appendix B). The questions pertinent to this study were those related to vending, inquiring if a vending contract existed and what type of product they targeted. Vending contracts were categorized based on the type of vending they covered; i.e., snack, beverage, or all vending (AV) contracts, which covered both snack and beverage. The questions also addressed the health stipulations within the contracts, including if the contract stated that the vendor must provide a healthy snack and/or beverage option (Y/N). This general mention of health was considered the base requirement for a healthy vending contract. Another question asked if the contract(s) specified the percentage or proportion of snack or beverage that must be 'healthy' or 'unhealthy' (Y/N), and respondents answering 'yes' progressed to the subsequent question which addressed whether someone was assigned to monitor adherence to the health stipulations (Y/N).

Data Analysis

Data for each vending machine was entered into the Brand Name Food List by each Provincial coordinator, output into a machine profile (specific percentage of products), entered into Excel, and then uploaded into the statistical package for analysis (SPSS Version 22.0 [IBM Inc]). Survey data was collected from each site, entered into Excel, and then also uploaded into the statistical package for analysis. Distribution and frequencies were examined and data was scanned for out of range values. Descriptive statistics were generated for the percentage of DNS, SS and SM products available in the vending machines of all 46 facilities, and for contract information; i.e., the presence of a vending contract, type of vending contract (snack, beverage, or AV), contract renewal, and contract health stipulations (general mention of health, specific details as to permitted products, and/or monitoring).

For the bivariate tests, Mann-Whitney *U* tests were used to analyze the data because the independent variables (percentage of DNS, SS and SM) were ordinal, group sizes were uneven, and measures of normality revealed that the data was not normally distributed (Field, 2009). Mann-Whitney *U* tests use mean ranks of the data to determine if there is a statistically significant difference between two independent variables. In this study, a lower mean rank demonstrated a lower percentage of products, whereas a higher mean rank demonstrated a higher percentage of products. Therefore, a lower mean rank for DNS products was considered a healthier outcome while a higher mean rank for SS and SM was a healthier outcome.

The primary research objective was examined by using these tests to determine if there were significant differences in the percentage of DNS, SS and SM products

between facilities with healthy vending contracts and those without (i.e., facilities with conventional vending contracts). Subsequent analyses also using Mann-Whitney *U* tests examined the secondary research question; whether those facilities with specific or monitored health stipulations had different vending health profiles. Data was classified as missing if staff were unsure of contract health stipulations. A priori significance was set at $p < 0.05$.

Results

Descriptive Statistics

Vending audit outcomes. Table 1 provides descriptive statistics from the vending audits performed in all recreation facilities with vending machines (N= 46). It provides insight to the overall health profile of vending in this sample of publicly funded recreation facilities, regardless of the presence of a vending contract. The audits revealed greater percentages of unhealthy products (DNS) compared to healthier products (SS and SM). In addition, the overall health profile of beverage vending was slightly superior to that of snack vending, with more DNS products (80.6%) available in snack vending compared to beverage vending (70.3%).

Table 1

*Descriptive Statistics for the Health Profile of Beverage and Snack Vending Machines
Based on the % of DNS, SS and SM Products Revealed in Vending Audits.*

Vending product category	N	Mean	Median	Standard deviation	Range

Beverage					
DNS	46	70.3	71.8	16.6	25.0 – 94.4
SS	46	16.0	12.7	11.3	0.0 – 58.3
SM	46	13.7	12.2	10.8	0.0 – 52.3
Snack					
DNS	37	80.6	84.0	17.9	26.7 – 100.0
SS	37	15.4	11.4	14.2	0.0 – 46.7
SM	37	4.0	2.5	5.5	0.0 – 26.7

Contract information. Seven of the 46 facilities with vending machines reported that they did not have a contract and were excluded from the analysis. In the remaining 39 facilities; 17 had AV contracts, 12 had specific contracts for both beverage and snack vending, and 10 had beverage-only contracts. After eliminating missing data (staff did not know if there were contract health stipulations), the final sample size was 31 beverage vending contracts and 24 snack vending contracts. Fifteen contracts were reported as ‘up for renewal’ during the 18-month EPL initiative.

A general mention of health was reported in 8 of the 31 facilities with a beverage contract and 7 of the 24 facilities with a snack contract. Of these few contracts that contained ‘general health’ stipulations, a statement typically suggested that the vendor must provide a healthy option. Compared to the inclusion of a general mention of health, fewer facilities reported specific health stipulations in beverage and snack contracts (5/31

and 5/24, respectively). Similarly, a small number of facilities ($n = 4$) with healthy vending contracts reported that someone was assigned to monitor adherence.

The Influence of Healthy Vending Contracts Versus Conventional Contracts on the Health Profile of Vending Machines

Figures 3 and 4 show the average percentage of DNS, SS and SM vending machine products available in facilities with contracts with health stipulations compared to those facilities with contracts without health stipulations; i.e., conventional contracts. Figure 3 demonstrates the differences in beverage products based on facility contract health stipulation and Figure 4 addresses snack products.

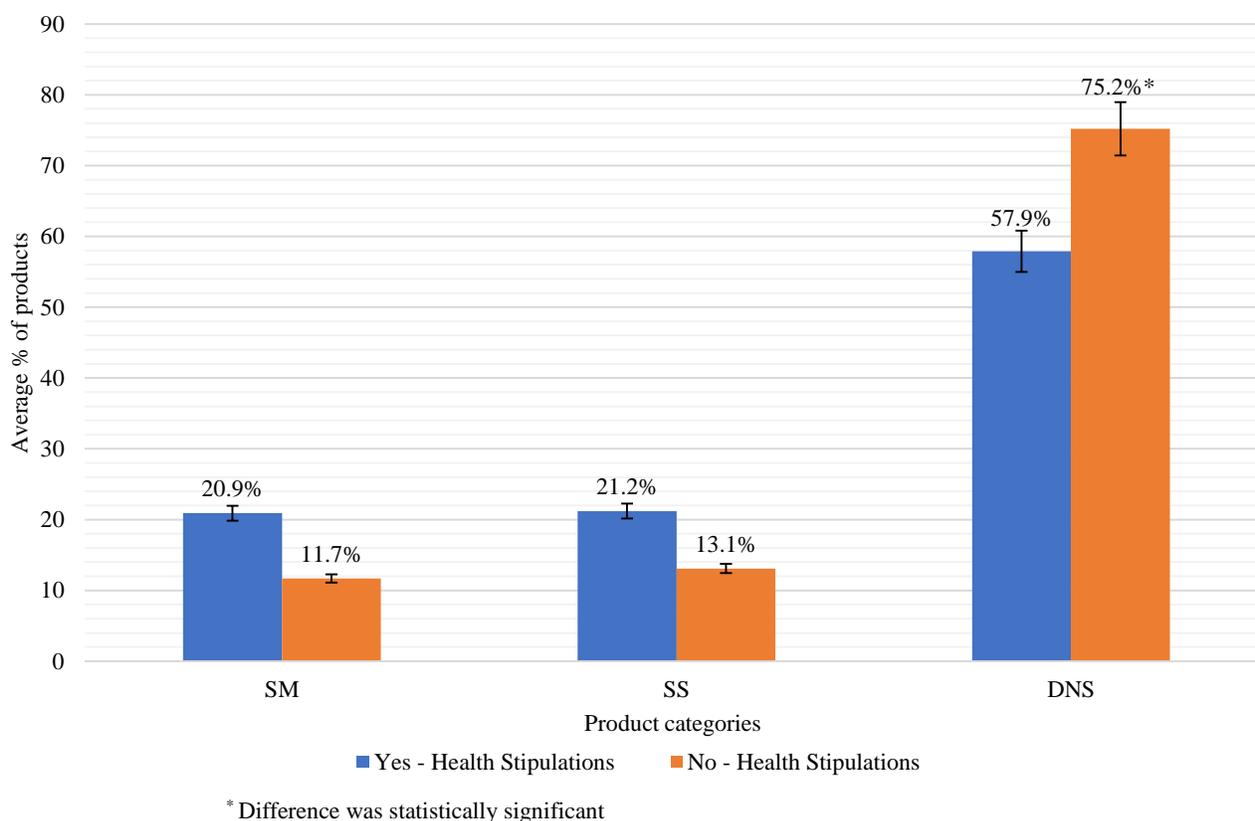


Figure 3. Comparison of the average percentage of SM, SS and DNS products in vending machines with beverage vending contracts ($n = 31$) by health stipulation.

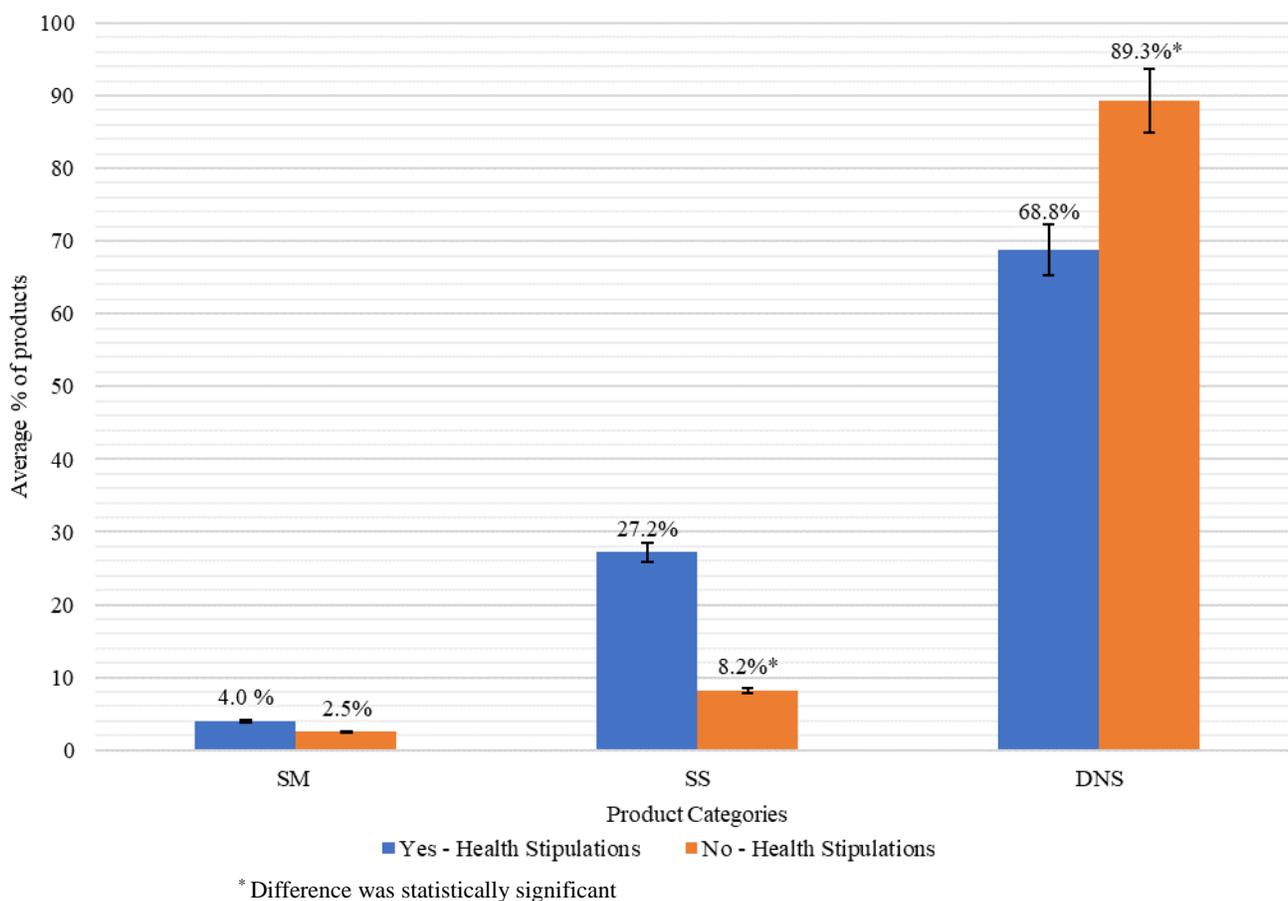


Figure 4. Comparison of the average percentage of SM, SS and DNS products in vending machines with snack vending contracts (n = 24) by health stipulation.

Appendix C displays the statistics from the Mann-Whitney U tests used to test the research objectives and determine if the greater percentage of healthier products and lower percentage of unhealthy products by contract type shown in Figure 3 and 4 were statistically significant.

Beverages. According to the Mann-Whitney U tests, the mean rank for the DNS beverage product category was significantly lower in healthy vending contract facilities (10.38) compared to that in facilities with the conventional vending contract (17.96; $U = 47.00$, $p = .042$, $r = -.36$). According to Cohen (1988) this is a medium to large effect

size, meaning there is a substantial difference (offering practical significance) in the availability of DNS beverages between facilities with healthy vending contracts and facilities with conventional contracts. In contrast, the mean rank of SS beverages in healthy vending contract facilities (19.75) and conventional contract facilities (14.70) did not differ significantly ($U = 62.00$, $p = .176$, $r = -.24$), nor did the mean rank for SM beverages in healthy vending contract facilities (19.94) and conventional contract facilities (14.63; $U = 60.50$, $p = .150$, $r = -.26$).

Snacks. For snack vending, the mean rank of DNS products in healthy vending contract facilities (5.43) was significantly lower than the mean rank for conventional vending contract facilities (15.41; $U = 10.00$, $p = .002$, $r = -.64$), which is considered a large effect size (Cohen, 1988). The mean rank for SS snacks in healthy vending contract facilities (20.07) was significantly higher than that of SS snacks in conventional contract facilities (9.38; $U = 6.50$, $p = .001$, $r = -.69$), another large effect size (Cohen, 1988). However, unlike the DNS and SS categories, the mean rank for SM snacks in facilities with healthy vending contracts (15.57) versus conventional contracts (11.24) did not differ significantly ($U = 38.00$, $p = .151$, $r = -.29$).

The Influence of Policy Quality (Specificity and Monitoring) on the Health Profile of Vending Machines in Facilities with Healthy Vending Contracts

Specificity. The Mann-Whitney U tests showed no significant difference in the health profile of vending between those beverage contracts that had specific health stipulations ($n = 5$) and general health contracts ($n = 3$). The mean rank for DNS beverages in contracts with specific health stipulations (5.60) and general health contracts (2.67) did not differ significantly ($U = 2.00$, $p = .101$, $r = -.58$); nor did the mean rank for

SS beverages (4.00 and 5.33; $U = 5.00$, $p = .456$, $r = -.26$) or SM beverages (3.60 and 6.00; $U = 3.00$, $p = .180$, $r = -.47$).

The Mann-Whitney U tests also showed no significant difference in the health profile of vending between those snack contracts that had specific health stipulations ($n = 5$) and general health contracts ($n = 2$). The mean rank for DNS snacks did not differ significantly between facilities with specific health stipulations in their contract (4.80) when contrasted to those with general health contracts (2.00; $U = 1.00$, $p = .121$, $r = -.59$); nor did the mean ranks for SS snacks (3.00 and 6.50; $U = .000$, $p = .051$, $r = -.74$) or SM snacks (4.60 and 2.50; $U = 2.00$, $p = .245$, $r = -.44$).

Monitoring. Mann-Whitney U tests revealed no significant difference in the health profile of beverage vending between contracts with ($n = 4$) and without ($n = 4$) monitoring as a policy feature. The mean rank for DNS beverages in contracts with monitoring (5.50) and those without (3.50) did not differ significantly ($U = 4.00$, $p = .248$, $r = -.41$); nor did the mean ranks for SS beverages (3.50 and 5.50; $U = 4.00$, $p = .248$, $r = -.41$) or SM beverages (3.75 and 5.25; $U = 5.00$, $p = .386$, $r = -.31$).

In addition, there was no significant difference in the health profile of snack vending between contracts with ($n = 4$) and without ($n = 3$) monitoring as a policy feature. The mean rank for DNS snacks did not differ significantly between facilities with monitoring in their contract (4.75) when contrasted to those without (3.00; $U = 3.00$, $p = .289$, $r = -.40$); nor did the mean ranks for SS snacks (2.88 and 5.50; $U = 1.50$, $p = .108$, $r = -.61$) or SM snacks (5.00 and 2.67; $U = 2.00$, $p = .157$, $r = -.53$).

Discussion

Publicly funded recreation and sport facilities reach many children and families in their communities (British Columbia Recreation and Parks Association, 2004; Harper & Lamont, 1997). The food environment in this setting is important because it has the potential to influence and support healthy choices for patrons (Carter et al., 2012; Geidne, Quennerstedt, & Eriksson, 2013; Kelly et al., 2010; Naylor, Bridgewater, et al., 2010; Naylor, Vander Wekken, et al., 2010; Olstad & Raine, 2013). Healthy vending contracts are a unique, localized, policy tool important for the implementation of broader FB policies. (Bell et al., 2013; Boelsen-Robinson et al., 2017; Naylor et al., 2015; Naylor, Vander Wekken, et al., 2010; Olstad, Lieffers, et al., 2011; Olstad, Raine, & McCargar, 2012). Few studies have specifically explored the impact of contracts as an intervention option in this setting. Thus, this study contributes a novel exploration of healthy vending contracts with respect to health profiles of vending machine packaged food products in publicly funded recreation facilities. This is important in the context of our data (with an average of 75.5% unhealthy products [DNS] available) and previous evidence (Chaumette et al., 2008; Naylor, Bridgewater, et al., 2010; Olstad, Poirier, Naylor, Shearer, & Kirk, 2015; Olstad, Raine, & McCargar, 2012; Thomas & Irwin, 2010) which showed that less healthy foods and beverages remain the predominant option in these publicly funded facilities.

The results suggest that healthy vending contracts mattered, resulting in less unhealthy products available in vending machines. The size of the effect of contracts on unhealthier products was moderate to large, highlighting their practical public health significance. However, the story varied depending on whether it was a beverage or a

snack contract and whether the comparison was by SM or DNS. For instance, facilities with healthy vending contracts had significantly less of the unhealthiest vending machine products (DNS) available for both beverages and snacks. Unfortunately, the data also revealed that the availability of healthier products (SS and SM) was not significantly better in facilities with healthy vending contracts, for beverage products specifically and SM products only in the snack category. Specificity and monitoring, markers of contract strength that have been linked both theoretically and through research to positive public health outcomes (Hamilton et al., 2007; Hawkins et al., 2016; McPherson & Homer, 2011; Olstad & Ball, 2015; Tauras et al., 2013; White et al., 2011), were not significantly healthier in vending profile. This may be due to study limitations that are discussed below. A detailed discussion of the key findings in the context of the literature follows.

The Efficacy of Healthy Vending Contracts

Although the majority of facilities in this study reported having some type of a vending contract, only a small number of the contracts met the criteria to be considered healthy (i.e., that at least mentioned health). This is not surprising considering that many recreation facilities have not prioritized healthy eating or nutrition policies (Naylor, Bridgewater, et al., 2010; Olstad, Downs, et al., 2011). In this study, facilities with ‘healthy’ contracts had healthier (on average) vending product profiles in some respects, namely through significantly less availability of DNS products. This supports the primary research hypothesis and previous research that found significantly improved health profiles of vending machines in BC recreation facilities that changed vending contracts to increase healthy products (Naylor et al., 2015; Naylor, Vander Wekken, et al., 2010). In 2010, these modified contracts were associated with an additional 16% improvement in

healthy choice vending products (Choose Most and Choose Sometimes) compared to comparison facilities (Naylor, Vander Wekken, et al., 2010). In 2015, healthy vending contracts were again associated with positive change (e.g. one community found a 54% increase in Choose Sometimes products and eliminated Choose Least products) (Naylor et al., 2015). Our findings reinforce the positive link between healthy vending contracts and healthier products, suggesting they are a potentially viable FB policy intervention to influence obesogenic environments.

Also consistent with prior research (Naylor, Vander Wekken, et al., 2010; Orava, et al., 2016), the significantly healthier profiles of vending products in facilities with healthy vending contracts compared to conventional contracts appeared to be greater in snack machines compared to beverage machines (significant difference in SS snacks but not SS beverages). This may be explained by inferior health profiles of snack vending which may allow greater room for improvement when a healthy vending contract is implemented, or it might also be the result of the increased variety of products. In contrast, Australian nutrition policies have been associated with greater improvements in the health of beverage vending, possibly due to easier acquisition of healthy beverages (Bell et al., 2013; Miller, Lee, Obersky and Edwards, 2015). The evidence on whether healthy FB policies impact food and beverages differently is inconsistent and deserves further examination.

We found that the significantly better vending health profiles found in facilities with healthy vending contracts compared to facilities with conventional contracts was primarily through decreased availability of least healthy products, both snack and beverages, while there was no significant difference in products meeting the highest

health criteria (SM). This corresponds with Australian health services research that linked a healthy vending contract with a greater reduction in unhealthy products (Boelsen-Robinson et al., 2017); and suggests that contract health stipulations may have a greater influence in reducing the availability of unhealthy options as opposed to increasing healthy ones. Likewise, provincial nutrition guidelines in one jurisdiction reportedly had less difficulty reducing unhealthy foods or beverages and greater difficulty increasing healthy ones (Olstad, Poirier, et al., 2015). The lesser effect on healthy products may be due to numerous barriers cited with their supply, including increased complexity, difficulty sourcing, limited convenience, loss of revenue, lack of consumer demand, and insufficient resources (Boelsen-Robinson et al., 2017; Grech & Allman-Farinelli, 2015; Naylor et al., 2015; Olstad, Downs, et al., 2011; Olstad, Lieffers, et al., 2011; Olstad et al., 2013; Olstad, Raine, & McCargar, 2012; Vander Wekken et al., 2012; van Hulst et al., 2013). However, a decrease in unhealthy products retains value as a public health outcome. For example, an Australian healthy vending contract was associated with an estimated reduction of 100.7 kilograms of sugar sold in beverage vending (Boelsen-Robinson et al., 2017).

Another advantage to decreased availability of DNS items is that it reduces patron exposure to unhealthiest options, thereby increasing the likelihood of making a healthier choice and contributing to improved vending status quo (Grech & Allmen-Farinelli, 2015; Olstad, Goonewardene, McCargar, & Raine, 2015). Schwartz et al. (2017) asserted that like tobacco control policies, social norms will change concurrent with an increased prevalence of FB policies. It may be sufficient for healthy vending contracts to focus

initially on reducing availability of unhealthy products while stakeholder acceptability increases, and further efforts are taken to reduce barriers to supplying healthy products.

Impact of Policy Quality on the Health Profile of Vending

Research supports the use of high quality (i.e., strong) policies for public health initiatives such as tobacco control (Frieden et al., 2005; Hamilton et al., 2007; Hawkins et al., 2016; Tauras et al., 2013; White et al., 2011), and school-based obesity interventions (Schwartz et al., 2017; Taber, Chriqui, Perna, Powell, & Chaloupka, 2012). As such, the second hypothesis was that stronger healthy vending contracts (specific) would have significantly healthier vending profiles; and strongest healthy vending contracts (monitored) would also have significantly healthier vending profiles.

According to our results, facilities with contracts with any health stipulation had significantly healthier vending profiles, but the profiles from facilities with higher quality features did not differ from those with a general mention of health. This may be reflecting sample size issues (see Limitations section) as very few facilities reported having health in their contract and even fewer reported having specific stipulations or monitoring. However, the significance found with overall health stipulations is a notable finding, suggesting that simply mentioning health in a vending contract may improve the food environment.

It is important to consider previous research that has linked specificity and strength with improved nutrition environments (Mayne et al., 2015) and better availability of healthy foods in public park vending (Mason, 2014). In this study, there was no significant difference between facilities with contracts with monitoring and those without in terms of health profile of vending, but researchers have indicated that policy

monitoring is integral to policy effectiveness in addressing nutrition environments (L'Abbé et al., 2013; McPherson & Homer, 2011; Olstad & Raine, 2013). Previous support of strong FB policies (specific and/or monitored), together with the limitations of this study to be discussed in the section following, indicates that the use of stronger healthy vending contracts should not be dismissed without further research using larger samples.

When Contracts Come up For Tender

An inevitable limitation of healthy vending contracts as a form of policy is their temporary nature. This impermanence does not ensure sustainability and could be especially problematic without sufficient time for a healthy vending contract to actualize positive change. This was one of the reasons cited as influencing the discontinuation of Denmark's fat tax (i.e., the policy enforcing a tax paid on saturated fat content in food) after 1 year, which consequently negated time for "incremental health effects to accumulate and become practically significant" (Sisnowski, Handsley, & Street, 2015, p. 727). It may also be problematic when no underpinning facility or state level policy is present and there are changes in staffing that result in a loss of institutional memory and consequently regression.

Nevertheless, the temporary nature of vending contracts also has a positive implication: it permits improvement of conventional contracts when they come up for tender. The use of contract renewals to improve the health of food and beverages has been cited in previous research (Bell et al., 2013; Boelsen-Robinson et al., 2017; Naylor et al., 2015; Naylor, Bridgewater, et al., 2010; Olstad, Raine, & McCargar, 2012). What is more, Olstad, Lieffers and colleagues (2011) found that an initial means of recreation

facility adoption of provincial guidelines was by including their standards in renewed contracts.

Almost one third of publicly funded recreation facilities in our study sample reported contracts up for renewal within the 18-month EPL intervention period. This shows potential for the development of healthy vending contracts, and the opportunity for existing ones to incorporate stronger health-related features during the renewal process. This is in accordance with previous recommendations to incrementally strengthen FB policies in publicly funded recreation facilities as time goes on (Olstad, Lieffers, et al., 2011), which is also an approach believed to be more feasible for unhealthy eating interventions (MacKay, 2011).

Limitations

The findings of this study must be viewed in the context of certain limitations. Most notably, a major limitation was the small number of healthy vending contracts in this sample, especially those with specific health stipulations or a monitoring component, which increased the likelihood that a true difference was rejected (Fink, 2013). The findings must also be interpreted with caution due to the cross-sectional nature of this study, which limited the ability to establish a causal link between the study variables (Fink, 2013). Further, non-parametric analyses reduces the power compared to parametric analyses (Munro, 2005), although the results of exploratory parametric tests (One Way Anovas) concurred with the non-parametric findings. Other limitations included the use of self-report from facility representatives regarding vending contracts and the lack of qualitative data which limited contextual insight, including information about the barriers and facilitators of developing and implementing healthy vending contracts.

Conclusion

This study contributes to the broader nutrition policy literature by exploring the potential efficacy of healthy vending contracts as a FB policy tool in publicly funded recreation facilities. The current findings suggest that healthy vending contracts are linked to healthier food and beverage vending profiles, which may also be conducive to improving social norms. This research could support guideline implementation in Canadian and other jurisdictions.

A substantive finding was that there was a significant difference in less unhealthy vending products between recreation facilities with a simple, generic health stipulation in their contracts and those without. While these data do not provide information on a direct causal link between generic policy and less unhealthy products, they do suggest that relatively simple stipulations (rather than more specific ones) may be supportive of improved nutrition environments. This is a notable finding considering the limited resources and barriers governments face in the FB policy field (Ashe et al., 2011; Crammond et al., 2013; MacRae, 2011; Mendes, 2008; Rose & Cray, 2010; Sisnowski et al., 2016; Wright, Smith, & Hellowell, 2017). Unfortunately, it is also important to note how far off the ‘ideal’ these facilities remained. Vending audits indicate that no facilities met the BC provincial guidelines (2014) of 50% SM and 50% SS products, nor were any near achieving these standards. It is consequently fitting that researchers continue to emphasize that FB policies be strengthened to make further improvements (MacKay, 2011; Olstad, Lieffers, et al., 2011; Olstad, Raine, & McCargar, 2012).

This study has several implications for public health policy and practice. First, it adds to the evidence base on policy intervention and obesogenic environments. While our

findings are derived from publicly funded recreation facilities specifically, the normalcy of vending in other settings suggests potential generalizability. Second, the findings of this study along with literature in support of localized FB policies (Ashe et al., 2011; Brooks et al., 2017; Mendes, 2008; Sisnowski et al., 2016) suggests the feasibility of localized FB policy approaches. This is further emphasized by the numerous barriers and lack of results associated with broader provincial guidelines in both recreation facilities (Naylor et al., 2015; Olstad & Ball, 2015; Olstad, Downs, et al., 2011; Olstad, Lieffers, et al., 2011; Olstad et al., 2013; Olstad, Raine, & McCargar, 2012) and in schools (McIsaac et al., 2015).

This study highlights several areas for future policy research. To fully understand how to best ameliorate the unhealthy food and beverage profile of publicly funded recreation facilities, future research needs to examine the impact of FB policies targeting food services beyond vending (e.g., cafes and concessions). What is more, evidence indicates that comprehensive FB policies will be more effective (Cullen et al., 2006; Jaime & Lock, 2009), thus warranting the examination of more comprehensive, facility-level FB policies that influence the broader nutrition environment. Future research might also add to the literature by addressing the limitations of this study. For example, a randomized control trial could look at causality, and qualitative research could shed light on the context behind healthy vending contracts and perceived social norms of stakeholders. Finally, prospective analysis is needed to provide greater insight into the true impact of healthy vending contracts.

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Appendix

Appendix A

EPL facility eligibility for BC, Alberta and Nova Scotia:

1. Facilities that have been involved in an intervention in the previous 5 years to improve their food/beverage environment are not eligible.
2. Must offer at a minimum vending OR a concession. Of course we prefer both but have room for a few facilities that offer one or the other.
3. Must have ability to make changes in the food environment if they choose to. (e.g., Could develop a policy around food that they could implement). Some examples....
 - If a facility had inflexible contracts with their vending and food providers, they would not be eligible.
 - If they had an inflexible contract with their concession provider but had room to make changes to vending – and were willing to try making those changes, that would be eligible.
 - If they only had a concession (no vending) and were willing to try making changes to the concession food environment, they would be eligible.
 - If they only had a concession (no vending) and had no way of making changes to the concession food environment, they would not be eligible.
4. Programming must be offered in the building (preferably kids programming). Municipal halls, office building where programs are dictated would not be eligible.
5. Facility should offer year round programming.
6. In the case where a number of facilities are overseen by the same recreation commission/ community/ administrator, we need to be careful how we treat these individual facilities. For example, if we have 2 facilities and one commission/ community/ administrator:
 - if each facility has individual food policy we would treat them as 2 facilities.
 - if they have a food policy that is the same across both facilities, we will treat them as one facility. We would measure both at baseline and if they are randomized to control would only measure one at follow-up (random). If they are randomized to intervention, we would measure both at baseline, then once randomized give them the option of targeting one facility for intervention (which is the one we would track and measure at follow-up). If they plan to make changes to both facilities, we would randomly select one as our target.
 - If there is NO food policy, and the facilities have different concession/ vending providers we can treat them as 2 facilities. Since one may be randomized to the intervention and one to control, we need to caution

them about contamination. We don't want the control facility learning from the intervention

EPL facility eligibility for Ontario:

As above except it does not matter if they have the ability to make changes to food policy.

Appendix B

Does your facility have a food or beverage service or other food related contract with any suppliers for...

- | | |
|---------------------------------|-----------------------|
| Concession/cafeteria? | (Y/N) |
| All vending services? | (Y/N) |
| Beverage only vending services? | (Y/N) |
| Snack only vending services? | (Y/N) |
| Other food services? | (Y/N) Please specify: |

If you answered yes to any of the above (or currently have a food-related contract).....

1) Have any changes been made to any of the contracts between now and then? (Y/N)

If any changes have been made to the contracts, we would like the following information for **both** the original contract (Dec 2016) and the current contract.

2) When is/was each food-related contract up for renewal? (month and year)

3) Do any of the food-related contracts include a corporate incentive program involving food or beverage items or services? (eg., if you sell more you get a higher percentage of sales, or some other incentive like free goods) (Y/N)

- **if yes**, please describe

4) Do any of the food-related contracts state that the vendor must provide a healthy food and/or beverage option? (Y/N)

If yes,

a. Do any of the contracts specify the percentage or proportion of food or beverage that must be 'healthy' or 'unhealthy' (eg., no more than 25% DNS)? (for each contract answer Y/N)

b. Please describe the specific terms of the "healthy" to "unhealthy" food ratio for each contract (eg. At least 50% SM and no more than 25% DNS).

c. Is someone assigned to monitor whether the products sold meet the healthy food criteria ineach of the contracts? (for each contract answer Y/N/I don't know)

d. If someone monitors that products sold meet the healthy food criteria, how often do they check the products? (monthly, every 3-4 months, twice per year, annually, sporadically, other time period?)

Appendix C

Table 2

Descriptive Statistics for Mann-Whitney U Tests with the Dependent Variables of Healthy Vending Contracts and Conventional Contracts

Contract Type	N	Mean Rank	Sum of Ranks
DNS Beverages			
Healthy Vending Contract	8	10.38	83.00
Conventional Contract	23	17.96	413.00
SS Beverages			
Healthy Vending Contract	8	19.75	158.00
Conventional Contract	23	14.70	338.00
SM Beverages			
Healthy Vending Contract	8	19.94	159.50
Conventional Contract	23	14.63	336.50
DNS Snacks			
Healthy Vending Contract	7	5.43	38.00
Conventional Contract	17	15.41	262.00
SS Snacks			
Healthy Vending Contract	7	20.07	140.50
Conventional Contract	17	9.38	159.50
SM Snacks			
Healthy Vending Contract	7	15.57	109.00
Conventional Contract	17	11.24	191.00

Table 3
*Descriptive Statistics for Mann-Whitney U Tests with the Dependent Variables of
 Contracts With and Without Specific Health Stipulations*

Contract Type	N	Mean Rank	Sum of Ranks
DNS Beverages			
Contract w/ specifics	5	5.60	28.00
Contract w/out specifics	3	2.67	8.00
SS Beverages			
Contract w/specifics	5	4.00	20.00
Contract w/out specifics	3	5.33	16.00
SM Beverages			
Contract w/specifics	5	3.60	18.00
Contract w/out specifics	3	6.00	18.00
DNS Snacks			
Contract w/specifics	5	4.80	24.00
Contract w/out specifics	2	2.00	4.00
SS Snacks			
Contract w/specifics	5	3.00	15.00
Contract w/out specifics	2	6.50	13.00
SM Snacks			
Contract w/specifics	5	4.60	23.00
Contract w/out specifics	2	2.50	5.00

Table 4

Descriptive Statistics for Mann-Whitney U Tests with the Dependent Variables of Contracts With and Without a Monitoring Component

Contract Type	N	Mean Rank	Sum of Ranks
DNS Beverages			
Contract w/ monitor	4	5.50	22.00
Contract w/out monitor	4	3.50	14.00
SS Beverages			
Contract w/ monitor	4	3.50	14.00
Contract w/out monitor	4	5.50	22.00
SM Beverages			
Contract w/ monitor	4	3.75	15.00
Contract w/out monitor	4	5.25	21.00
DNS Snacks			
Contract w/ monitor	4	4.75	19.00
Contract w/out monitor	3	3.00	9.00
SS Snacks			
Contract w/ monitor	4	2.88	11.50
Contract w/out monitor	3	5.50	16.50
SM Snacks			
Contract w/ monitor	4	5.00	20.00
Contract w/out monitor	3	2.67	8.00

Chapter 3: Summary, Implications for Public Health Policy and Practice, and Recommendations for Future Policy Research

Summary

Current public health goals to reverse the prevalence of childhood obesity necessitates improving the availability of healthier foods and beverages and decreasing the prevalence of non-nutritious energy dense foods in the settings where children spend their time. This study focused specifically on Canadian publicly funded recreation facilities – a setting known for its obesogenic food environment (Chaumette, Morency, Royer, Lemieux, & Tremblay, 2008; Naylor, Bridgewater, Purcell, Ostry, & Vander Wekken, 2010; Thomas & Irwin, 2010) and frequently visited by children (Naylor, Bridgewater, et al., 2010; Olstad, Lieffers, Raine, & McCargar, 2011; Thomas & Irwin, 2010). Unhealthy products are prevalent in sport and recreation facility vending machines (Chaumette et al., 2008; Naylor, Bridgewater, et al., 2010; Olstad, Poirier, Naylor, Shearer, & Kirk, 2015; Olstad, Raine, & McCargar, 2012; Thomas & Irwin, 2010), highlighting vending as a key contributor to the unhealthy food environment. The literature reviewed in Chapter 1 of this thesis-style manuscript suggested that localized FB policies may have a significant role to play in addressing this public health issue.

This study set out to determine whether Canadian publicly funded recreation and sport facilities with healthy vending contracts had healthier vending machine food profiles than those facilities that did not. This objective was examined by analyzing the outcomes of vending machine audits in relation to the type of vending contract in place (i.e., healthy vending contract or conventional contract). We found that facilities with healthy vending contracts had significantly healthier vending profiles compared to

facilities with conventional contracts. For the most part, the healthier profile was represented by significantly less availability on average of unhealthy (DNS) products in facilities with healthy vending contracts – a difference that may reflect less availability, higher cost and less demand associated with healthier products (Boelsen-Robinson, Backholer, Corben, Blake, Palermo, & Peeters, 2017; Grech & Allman-Farinelli, 2015; Olstad, Downs, Raine, Berry, & McCargar, 2011; Olstad, Lieffers, et al., 2011; Olstad, Raine, & McCargar, 2013; Olstad, Raine, & McCargar, 2012; Vander Wekken, Sørensen, Meldrum, & Naylor, 2012). The quantitative design of this study limited a more thorough interpretation of the context.

A secondary research objective was to explore the additional influence of policy quality (i.e., healthy vending contracts with stronger characteristics such as specifications or monitoring) on the health profile of vending machines. Vending profiles did not differ based on the specificity of the contract health stipulations, despite substantial literature indicating that policies have a more profound impact with higher quality policy characteristics (Frieden et al., 2005; Hamilton, Biener, & Brennan, 2007; Hawkins, Bach, & Baum, 2016; L'Abbé et al., 2013; Mason, 2014; Mayne, Auchincloss, & Michael, 2015; McPherson & Homer, 2011; Olstad & Raine, 2013; Schwartz, Just, Chriqui, & Ammerman, 2017; Taber, Chriqui, Perna, Powell, & Chaloupka, 2012; Tauras, Huang, & Chaloupka, 2013; White et al., 2011). The finding in this study is likely due to the small number of healthy vending contracts within the sample of recreation centres, particularly of those contracts with stronger characteristics, thus increasing the chance that a true difference was rejected (Fink, 2013).

It is important to note that vending audits in the vending machines of this sample of publicly funded recreation facilities revealed a high prevalence of unhealthy food and beverage products, regardless of the presence of a healthy vending contract. No facilities met the BC provincial guidelines (2014) of 50% SM and 50% SS, nor were any near achieving these standards. The obesogenic status of many of these settings warrants further action which may include developing or strengthening healthy vending contracts and implementing other FB policies and/or capacity building initiatives.

Implications for Public Health Policy and Practice

In response to the need for further research highlighting effective ways to reduce the prevalence of childhood obesity, this study uniquely addresses localized FB policies in the form of healthy vending contracts. As such, a key contribution of this study to public health practice is the evidence that policy intervention may contribute to addressing the obesogenic environment in publicly funded recreation facilities. Further, the presence of vending and vending contracts is commonplace, thus this study offers potential relevance to other settings.

Another important implication of this study derives from the improvements associated with policies developed from the bottom-up (localized policy). In this study, recreation facility employees established healthy vending contracts at the ‘street-level’; and analysis revealed some promising findings associated with these localized policy documents. These findings, along with literature in support of localized FB policies (Ashe, Graff, & Spector, 2011; Brooks et al., 2017; Mendes, 2008, Sisnowski, Street, & Braunack-Mayer, 2016) suggests that healthy vending contracts may be an effective policy route for addressing obesogenic environments. This is especially important

considering broader provincial guidelines have been associated with numerous barriers and lack of results in both recreation facilities (Naylor, Olstad, & Therrien, 2015; Olstad & Ball, 2015; Olstad, Downs, et al., 2011; Olstad, Lieffers, et al., 2011; Olstad et al., 2013; Olstad, Raine, & McCargar, 2012) and in schools (McIsaac, Shearer, Veugelers, & Kirk, 2015). Policy makers and other decision makers may find this of interest when deciding what level to implement policy at or where to direct resources and/or implementation supports. It may be that a two-tiered solution, e.g., state and local level, is essential.

Finally, we found health outcomes in facilities with contracts that had any health stipulation, suggesting health differences in food environments with a simple approach. Considering the limited resources and barriers governments face in the FB policy field (Ashe et al., 2011; Crammond et al., 2013; MacRae, 2011; Mendes, 2008; Rose & Cray, 2010; Sisnowski et al., 2016; Wright, Smith, & Hellowell, 2017), it is notable that positive change (albeit modest and less than the stated ideal) may be actualized with small actions. More specifically, the findings in our study suggest that effective FB policies should incorporate at least a general mention of health.

Recommendations for Future Policy Research

As displayed in Figure 2 of Chapter 2, vending is only one aspect of the food environment in publicly funded recreation facilities. Therefore, other elements of the food environment including cafes, restaurants and concessions, also contribute to the obesogenic environment found with many of these facilities (Chaumette et al., 2008; Naylor, Bridgewater, et al., 2010; Thomas & Irwin, 2010). To fully understand how to best ameliorate the unhealthy food and beverage profile of publicly funded recreation

facilities, future research needs to examine the impact of FB policies targeted toward the other food services (beyond vending). What is more, evidence indicates that comprehensive FB policies will be more effective (Cullen, Watson, Zakeri, & Ralston, 2006; Jaime & Lock, 2009). The examination of more comprehensive, facility-level FB policies that influence not only vending contracts, but also other food services is warranted.

Another area for future research is the context influencing healthy vending contracts. Such examination could shed light on important factors that influence the adoption and implementation of healthy vending contracts. It would also be of interest to see if the availability of healthy vending impacted the perceived social norms of recreation facility staff and/or patrons. A key contribution of these types of environmental changes are their ability to “make a healthy choice the default” (Ashe et al., 2011, p. 890). Based on statements like these and other academic literature detailed in Chapter 1, we assume that healthy vending contracts may contribute to improved social norms for healthy foods and beverages. This is important research to understand the true impact of healthier vending products made available. Finally, this study utilized a cross-sectional design exploring the differences between healthy vending contracts and conventional contracts. As stated in Chapter 2, this limits the ability to interpret a causal link in the findings (Fink, 2013). Future prospective analysis measuring the health profile of vending machines before and after policy implementation would address this limitation and add to the literature.

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