University of Alberta

Assessing and Catalyzing Adoption and Implementation of the Alberta Nutrition Guidelines for Children and Youth in Recreational Sports Settings

by

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Dedication

This thesis is dedicated to those I most admire in the world, my family.
To Dad, Mom, Brad and Candace, and Darren.
Without all of you I would not be where I am today.
Thank you for being a consistent, loving presence in my life,
through good times and bad. I thank the Lord for all of you.

To Jaxton, Addison and Whitney, you are the sunshine in our lives!

Jeremiah 29:11 *"For I know the plans I have for you declares the Lord,*
plans to prosper you and not to harm you,
plans to give you a hope and a future."
New International Version Bible

Joshua 1:9 *"Be strong and courageous. Do not be afraid,*
for the Lord your God will be with you wherever you go."
New International Version Bible

Abstract

Although the mandate of recreational facilities is to enhance well-being, many have unhealthy food environments that may paradoxically increase obesity risk. The Alberta Nutrition Guidelines for Children and Youth (ANGCY) are government-initiated, voluntary guidelines intended to facilitate children's access to healthy food and beverage choices in recreational facilities. The purpose of these studies was to investigate: 1) Awareness, adoption and implementation of the ANGCY, 2) Factors that influenced uptake of the ANGCY and the nature of the food environment within 3 cases: an adopter, a semi-adopter and a non-adopter of the ANGCY, and 3) Practical strategies to support healthy food purchases by patrons in recreational settings. Findings from a provincial survey (n=151 recreational facilities) showed that one-half of facilities had heard of the ANGCY and only 6% had implemented them 1 year following their release. A multiple case study revealed that managers were nutritional gate-keepers of recreational facility food environments, their nutrition-related knowledge, beliefs and perceptions shaped their adoption and implementation of the ANGCY. Intersectoral linkages with schools and health promoting partnerships with industry were also important for adoption and implementation to occur. Financial constraints emerged as a strong and consistent barrier to ANGCY uptake. Managers from industry who adopted the ANGCY took a long-term view of profitability and were willing to take small risks, sacrificing short-term profitability to remain on the leading edge of market trends. An intervention tested the impact of increased availability of healthy items, 2 nudges and an economic incentive on purchase of healthy items by patrons at an outdoor community pool. Food availability proved to be an independent environmental determinant of food purchasing behaviors in this context, while mixed evidence was

found for the efficacy of nudging. Price reductions appeared ineffectual in this setting. Overall, findings suggest ANGCY uptake may continue to falter under the current voluntary approach, as the environmental supports for voluntary action are poor and managers fear revenue loss. Multiple strategies will be needed to optimize food selection in recreational settings, however increasing the availability of healthy foods offers significant potential to improve patrons' food purchasing behaviors.

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List of abbreviations

ANCOVA: Analysis of covariance
ANGCY: Alberta Nutrition Guidelines for Children and Youth
BMI: Body mass index
CLO: Choose least often
CMO: Choose most often
CS: Choose sometimes
EnRG: Environmental Research framework for weight Gain prevention
Kcals: Kilocalories
NEMS-R: Nutrition Environment Measures Survey in Restaurants
RD: Registered Dietitian
SEM: Standard error of the mean
SES: Socioeconomic status
US: United States

CHAPTER 1: Introduction

1.1 Childhood obesity and dietary behaviors

In 2004, the last time that heights and weights of a large representative sample of Canadian children of all ages (aged 2-17) were assessed, 18.1% of Canadian children were classified as overweight, while 8.2% were deemed to be obese [1]. These figures represent a doubling of the combined overweight/obesity rates among youth aged 12-17, and a tripling in overall obesity rates over a span of 25 years [1]. More recent data from a smaller representative sample of 3-17 year olds suggests the possibility that rates of overweight have declined to 16.2%, whereas obesity rates appear unchanged at 8.1% [2].

Childhood obesity is an independent risk factor for adult overweight/obesity [3, 4], with obese children having at least a 25-50% increased risk of being obese as adults [5]. Obesity significantly diminishes quality of life and adversely affects children's physical, mental and social health [6, 7]. Poor dietary quality is an important risk factor for childhood obesity and chronic disease [8, 9]. Children who eat fruit and vegetables 5 or more times daily, for instance, are substantially less likely to be overweight or obese compared to those with less healthy diets [10].

Many dietary behaviors that increase the risk of obesity are prevalent among Canadian children. Beginning at a young age, 20% of children have energy intakes that exceed their energy requirements, and this proportion increases to 30% at older ages [10]. Canadian children obtain nearly a quarter of their calories from foods other than those in the 4 food groups of Canada's Food Guide, eat fast food and drink sugar sweetened beverages frequently, and the majority consume < 5 servings of vegetables and fruit daily [10, 11]. Findings among adolescents in Alberta are similar, as 42% have poor diet quality, with suboptimal intakes of micronutrients, low intakes of foods that are part of Canada's Food Guide, and high intakes of foods from the 'other' food group [12]. Childhood is a formative period for future habits, and thus teaching children to eat healthfully at an early age can establish a solid foundation for lifelong healthy eating. Policies and programs that improve children's dietary behaviors might therefore yield dividends well into the adult years and make an important contribution to reducing obesity and chronic disease at a population-level.

1.2 Socio-cognitive and socio-ecological models

Interventions to improve children's dietary behaviors have often been grounded in socio-cognitive models of health behavior change which posit that informational and motivational deficits are primarily to blame for unhealthy behaviors. Such individually focused strategies attempt to educate and motivate individuals to eat more healthfully. Socio-cognitive models can at best explain 40% of variance in behavior [13, 14], however, and have therefore had limited success in addressing unhealthy dietary behaviors, prompting investigation of alternate causes and solutions.

Rather than attributing unhealthy dietary behaviors and obesity to a failure of individual will power or a lack of information, the high prevalence of unhealthy dietary behaviors and obesity are now regarded as an unintended negative consequence of broader

macroenvironmental forces including cultural changes, trade liberalization and technological and commercial advances [15]. Indeed, obesity is perhaps a logical outcome of market economies focused on consumption-based growth [16]. These changes have had profound implications for global food systems, as profit-oriented large transnational corporations, and not governments now control the world's food supply [15]. This corporate dominance has led to mass production of the most profitable foods, which tend to be energy-dense and nutrient-poor. In an attempt to increase their sale, these foods have been engineered to be highly palatable, and are attractively priced and marketed heavily. The consequences are evident in the overwhelmingly unhealthy nature of modern food environments. These environments have been termed 'obesogenic' because they make unhealthy eating the most logical outcome [17]. In the current context it has therefore become evident that although individual-level informational and educational approaches may be necessary to address unhealthy dietary behaviors and obesity, they will not be sufficient because obesogenic environments consistently overwhelm rational decision making, driving dietary behaviors in the direction of positive energy balance [17].

Given that the drivers of obesity are environmental, solutions will require changing the nature of the environments to which individuals are exposed. Ecological models integrate multiple levels and types of influences, and the reciprocal interactions among them, in a systems-level perspective of human behavior. In an ecological model, individuals' health behaviors are modelled as the product of influences at individual (eg. knowledge, self-efficacy), interpersonal (eg. supportive social relationships), organizational (eg. access to healthy foods in workplace cafeteria), community (eg. grocery stores in the neighborhood) and policy-levels (eg. agricultural subsidies). Such models represent a significant advance over traditional behavioral paradigms because they acknowledge the interdependent and reciprocal relationships among individuals, their health and their environments [17]. Ecological perspectives have enlarged the scope of scientific investigations beyond individual factors to consider how environments can support individual attempts to engage in healthy dietary behaviors and inform much current nutrition and obesity-related research.

1.3 Overview of food environments

The food environment refers to the availability, accessibility and promotion of healthy and unhealthy foods. Environmental exposures including food availability [18, 19], marketing [20], price [21], and portion size [22] profoundly shape children's dietary behaviors. Children are particularly vulnerable to environmental exposures, as they have little control over their environments and cannot easily obtain food outside of their immediate contexts. Interventions to improve children's food environments are therefore a high priority, with significant potential to improve their dietary behaviors and body weights.

1.3.1 Food environment frameworks

Socio-ecologic frameworks can provide a basis for conceptualizing the complex, multi-level influences on children's dietary behaviors and body weights. Given their breadth, however, they are not amenable to the formulation of empirically testable hypotheses because they do not identify targets of measurement or intervention. A more specific

theoretical basis for disentangling environmental influences, and understanding whether and how specific environmental factors influence dietary behaviors is required. Kremers et al [13] have elaborated such a model that integrates ecological theory with what is known regarding the duality of human decision making to understand how environmental factors might influence energy balance-related behaviors. Environmental Research framework for weight Gain prevention (EnRG) (Figure 1.1) is a dual-process model which posits that the environment can influence human behavior in direct and indirect ways [13]. In the direct, unmediated route of influence, individuals respond directly to environmental cues, leading to mindless and automatic actions [13]. Individuals might, for example, purchase a chocolate bar upon seeing a display at the point-of-purchase, or buy a hamburger because it is the normative and most convenient option. Alternatively, the model proposes that the environment can also influence behavior indirectly, through prompting thoughtful deliberation on the part of individuals [13]. Examples of this mediated route include instances where poor accessibility of healthy foods reduces self-efficacy towards healthy eating, or high prices of healthy foods reduces motivation to purchase them [13]. Individuals do not process most food-related information in a cognitive and rational manner, however, and therefore the direct, unmediated pathway may be the dominant route through which environments influence dietary behaviors [23]. The model additionally suggests that personal and behavioral factors may moderate the impact of environmental factors on energy balance-related behaviors [13].

EnRG relies on the Angelo framework [17] to dissect the nebulous concept of 'the environment' into 2 levels and 4 types of environments. Microenvironmental settings are the locations in which individuals interact with others, including schools, workplaces and neighborhoods [17]. These microenvironmental settings are influenced by broader macroenvironments or sectors, such as government, the food industry and the health care system [17]. Four types of environments exist within micro and macroenvironments: physical (what is available), sociocultural (what are the cultural and social influences), economic (what are the costs) and political (what are the rules) [17]. Integration of the Angelo framework within EnRG facilitates identification of concrete points of intervention within food environments. Although empirically plausible and consistent with what is known regarding dietary behaviors, the validity of the model has not yet been established, however.

1.3.2 Food environment assessment

Studies of the impact of food environments on dietary behaviors have been hampered by the difficulty of identifying and measuring what constitutes an individual's 'true' environment [24]. Individuals live and function within many micro and macroenvironments, each of which has physical, social, economic and political dimensions [17]. Thousands of factors within each of these environments might influence dietary behaviors, and it is not clear which factors are the most relevant [25]. For instance, is the price of fruits and vegetables in grocery stores close to individuals' homes influential, or might it be more important to consider prices of healthy entrees in restaurants near workplaces, or perhaps broader economic policies at a provincial or national level? In studies of the impact of access to supermarkets on dietary behaviors, is it the store's proximity to an individual's home, the quality and range of produce

offered, the presence of unhealthy items at the checkout counter, the store's hours of operation or other characteristics that are most important [25]?

A subsequent challenge concerns how to operationalize and measure these environmental exposures. Because there is no precise, operational definition of what is or is not included as part of the food environment, it is not clear what measures must be used. Ohri-Vachaspati et al [26] identified 48 different tools designed to capture individuals' perceptions of, and actual objective characteristics of food environments [26]. Tools that capture individuals' perceptions include surveys and interviews, whereas measures of the physical food environment are more diverse, from simple checklists of food availability, to more comprehensive tools that consider marketing, price, and other access measures [26]. Of the tools available for assessing the objective food environment, the Nutrition Environment Measures Survey in Stores [27] and Restaurants [28] are perhaps the most widely used in North America. Different tools capture different constructs [29], and agreement among objective and subjective measures is sometimes low [30, 31], however, suggesting that it may be important to use multiple tools within individual studies. Conversely, consolidation of current measures into a single tool would enable cross-study comparisons.

Having identified 'true' environments and appropriate measures, it is then necessary to ascertain which behavioral outcomes are the most important [25]. Science has not yet determined whether it is more important that individuals consume 5 fruits and vegetables a day, avoid sugar sweetened beverages, or achieve a high score on a particular index of dietary quality, however selection of outcome measures must nevertheless be made. Associations between environmental factors and dietary behaviors will differ according to the nutrition-related outcomes that are selected. Scientists attempting to understand the interrelationships among food environments, dietary behaviors and body weights must carefully consider all of the above issues.

1.4 Food environment interventions

The preceding discussion has provided a compelling basis for understanding obesity as a consequence of obesogenic environments and suggests that environmental interventions, particularly those targeting direct environmental influences on dietary behaviors, are a high priority. In the following sections, the efficacy of environmental change in improving food environments, dietary behaviors and body weights will be examined, according to the 4 types of environments outlined in the Angelo framework: physical, economic, sociocultural, and political. Key considerations related to these environments and to interventions within them will also be described.

1.4.1 Physical environments

1.4.1.1 Food availability

Food availability has been variously interpreted, however in this thesis, food availability refers to whether or not foods are present in a particular setting. A large body of evidence indicates that the availability of healthier foods within homes [18, 19, 32] and schools [33-36] independently and strongly influences their selection and consumption. A small number of studies have also shown that increasing the availability of healthy items in community commercial settings independently supports their sale [37-40].

Manipulating food availability may therefore be an important means to improve food environments and dietary behaviors.

A central question within the food availability literature concerns whether it is sufficient to increase the availability of healthier items, or whether concurrent restrictions on the availability of unhealthy items are also required to improve dietary intake. If environmental factors are the primary drivers of food selection, then offering healthy and unhealthy foods together, and expecting individuals to select healthy items in the context of highly obesogenic environments may be unrealistic. Conversely, if individuals make rational food-related decisions to maximize their long-term interests, then restricting the availability of unhealthy items should not be necessary.

Experimental studies that have assessed the independent impact of increased availability of healthier foods on their selection and/or consumption are few, and have yielded mixed findings. Bere et al [34] found that Norway's free school fruit program led to a doubling of children's fruit and vegetable intake at school. Di Noia and Contento [39] similarly found that providing youth with 3 daily servings of fruit, juice and vegetables led youth to consume 5.41 servings of fruits and vegetables daily, well above the national average of 3.6 servings daily. In another study, laws requiring fruits and vegetables to be served in school meals appeared to improve children's fruit and vegetable intake [41]. By contrast, increasing the availability of low and moderate fat entrees in a school cafeteria only increased their selection when the availability of high fat entrees was simultaneously reduced [42]. Similarly, the introduction of school fruit tuck shops to 23 schools did not increase students' average fruit consumption compared to students in control schools [43]. However, students' fruit consumption did increase in schools with fruit tuck shops that did not allow children to bring unhealthy snacks to school [43]. These findings are in keeping with evidence from many other studies suggesting that the likelihood of selecting healthy items decreases in the presence of tasty, less healthful options [37, 44-46]. Thus, students with no, or limited access to competitive foods in snack bars [47-49], vending machines [49-51], nearby convenience stores or fast food restaurants [51] have better dietary behaviors compared to students with unrestricted access to these sources of unhealthy foods. When access to unhealthy foods is reduced students are furthermore more likely to participate in school meal programs which can support healthier dietary practices [52, 53]. In addition, introduction of rigorous nutrition policy standards that result in increased availability of healthier items and reduced availability of less healthy items have consistently been shown to improve children's dietary intake [41, 49, 54-56].

Thus, while it is important to increase the availability of healthier items, concurrent restrictions on availability of unhealthy items has potential to further improve children's dietary intake and body weight. Such measures may still prove insufficient, however, as when unhealthy items are restricted, but not eliminated, children continue to select [57] and consume unhealthy items, albeit less frequently in some cases [49]. Even when selecting from among healthy school lunch options children's selection of key nutrient-dense items such as fruits and vegetables remains low [58-60], and they are often wasted [58, 59, 61]. Multiple, complementary strategies will therefore be needed to optimize children's dietary intakes. Such strategies could target children's food

preferences, such as through repeated taste testing, as they are linked to intake of healthy foods such as fruits and vegetables [62], and could seek to improve the accessibility and promotion of healthier items.

It is conceivable that either approach, increased availability of healthy items or increased availability of healthy items concurrent with reduced availability of unhealthy items, could lead to the unintended consequence of increasing, rather than reducing caloric intake. In the former case, increased energy intake might occur if children simply add healthier foods to their diets, rather than substituting healthy items for unhealthy items. Long-term studies will be needed to evaluate this prospect. With respect to the latter, if availability of unhealthy foods is restricted, children might simply obtain unhealthy foods elsewhere, potentially in even greater quantities [46, 63-65], although many studies suggest such dietary compensation is unlikely to occur [17, 49, 54, 55, 66-68].

1.4.1.2 Food accessibility

Food availability and accessibility both influence dietary behaviors, but their relative importance is unclear. Clearly healthy foods must be available if they are to be consumed, however, even if healthy foods are available, they may be relatively inaccessible to certain individuals or groups for reasons related to their visibility, aesthetic appeal, normative nature, convenience, and many others. Nudging is an approach to human behavior change that uses subtle environmental cues to shift behaviors in positive directions, in effect altering food accessibility, without limiting the available options [69]. Wansink and Just are perhaps best known for their investigations of the potential to nudge children to purchase healthier foods, through increasing the convenience [70, 71], variety [72], and visibility of healthier items [73]. Others have also nudged children to select healthier foods through verbal prompts [74, 75], enhancing aesthetic appeal [75], using brand characters [76] and increasing food variety [75]. The impact of nudging on dietary behaviors has generally been small and inconsistent, however, and context dependent [70, 77, 78].

The appeal of nudging stems principally from its simplicy, low-cost, potential to maintain revenues and avoid the need for stronger policy measures [79]. Some [80] contend that nudging may be more effective than policy measures in improving children's dietary behaviors, arguing that requiring children to select healthier items does not teach them to make better choices, and can lead to harmful reactance behaviors whereby children overconsume restricted foods [63, 64]. Nudging, by contrast, is said to preserve choice and teach children to make healthier choices even when confronted by unhealthy options [81]. Children, they maintain, are more likely to eat items if they believe they have independently selected them than if they have been compelled by policies to do so [81].

The veracity of these claims is uncertain, however, as findings are conflicting. In one study, nudging children to select healthier foods through converting a school lunch line into a convenience line offering only healthy options led children to select 18% more healthier items [70]. Increased selection did not translate into increased consumption, however, as students wasted more of these foods [70]. Policy measures requiring

students to put a fruit or a vegetable on their lunch trays yielded similar results, in that the policy modestly improved fruit and vegetable intake, while increasing waste substantially [61]. Notably student's fruit and vegetable intake did improve significantly when policies were implemented concurrently with a nudge, suggesting that combined approaches may be optimal [61].

Although the food industry has been successfully nudging consumers to purchase its mostly unhealthy products for decades, it remains unclear whether public health can successfully leverage nudging within existing obesogenic environments on the scale needed to address unhealthy dietary behaviors and obesity. Currently, heterogeneity in nudges, populations, settings and outcomes makes it impossible to discern the efficacy of nudging healthier dietary behaviors at a population-level, and nudging has not been evaluated over the long-term [79]. Studies are needed to determine whether nudging is truly a stand-alone strategy that can obviate the need for stronger policy measures, or whether it should be considered primarily as a complement to other obesity prevention strategies.

1.4.2 Economic environments

High prices on healthy foods can present a formidable barrier for some individuals to eat healthfully, thereby contributing to health disparities [82, 83]. Fiscal measures are among the health promotion interventions that can be expected to generate substantial health gains while entirely paying for themselves [84]. As a result, intervening within economic food environments is a high priority, and such interventions are well-represented within the literature. Systematic reviews have concluded that economic instruments modify purchases of targeted foods, and influence body weight [21, 85]. Of particular relevance to this thesis, several of these reviews have concluded that subsidies on healthier foods significantly increase purchase and consumption of promoted products [86-88] and are associated with lower body weights among children and adults [85].

Interventions within economic food environments are complex, however, and must be carefully crafted and matched to the characteristics and circumstances of target groups. Economic interventions can be rendered ineffective in a number of ways. Substitution effects, for instance, can occur when individuals simply shift their consumption away from taxed foods towards other unhealthy products that are not subject to taxation [89]. Income effects might also materialize, whereby the savings from discounted healthy foods are used to purchase other unhealthy products [89]. Cost-effectiveness must also be considered to ensure a particular incentive actually changes undesirable behaviors, rather than simply providing a subsidy to individuals who already practice the targeted healthy behavior [89].

The use of economic incentives requires specification of the foods or nutrients to target, a difficult prospect given that few foods or nutrients are considered unequivocally healthful or harmful in all circumstances. The appropriate level of any tax or subsidy must also be determined. Some evidence indicates that the lower bounds for a meaningful subsidy is 10% [86], while others suggest it is 25% [87]. A minimum 10% tax on sugar sweetened beverages has been proposed, as taxes < 5% are considered too

small to be effective [90, 91]. The higher the incentive the greater the impact on behavior, but the lower its feasibility from an industry/government perspective [21]. Economic incentives should also be explicit, as their impact is diminished when consumers are unaware of them [21]. Effect modification must also be considered, as some populations are more price sensitive than others. Low income populations, for whom food represents a larger proportion of total expenditures, are predictably more price sensitive [85, 92-95]. Moreover, the effectiveness of pricing interventions differs by item. The relatively low price elasticity of fruits and vegetables means that changes in price may have limited influence on their purchase, whereas the higher price elasticity of sugar sweetened beverages means that price changes can dramatically change their purchase [85].

Although consumers prefer price discounts on healthy food items [96], it is not clear whether taxation or subsidies are more effective from a public health perspective [21]. Taxes have the added advantage of generating revenue that can be used to fund other public health activities, such as subsidies on healthy foods. The optimal strategy both from a public health and an industry perspective might be to combine subsidies on healthy foods with price increases on unhealthy foods, as such strategies have the potential to improve health without harming profits [21].

The economic environment is important not only in terms of food price, but also in terms of individual and area-level incomes [17]. Individuals of lower socioeconomic status, and those who reside in disadvantaged areas tend to have poorer energy balance-related behaviors [97-99] and health outcomes, and higher obesity rates [100-103]. It is likely that interventions targeting issues such as minimum wage policies and affordable transport and housing will be more efficacious in improving population-level dietary behaviors and body weights than simple economic incentives because they address the root causes of economically-linked unhealthy dietary behaviors, whereas economic incentives can merely ameliorate their negative manifestations.

1.4.3 Sociocultural environments

Sociocultural environments concern society's attitudes, values and beliefs regarding food [17]. Group structures, values, ideas and expectations surrounding food, eating and body size create social and cultural environments that either support or protect against obesity [104]. Measurement of sociocultural environments is complex, and thus many of these areas have received limited study. Nevertheless social relations remain highly influential with respect to children's food-related behaviors and eating cannot be divorced from the context in which it occurs [18, 19, 105].

Children may make personal food selections, but these choices are shaped by their relationships with others and are structured by activities that take place in social contexts, such as in family groups, at work and at school [105-107]. For instance, fruit and vegetable social norms are positively correlated with fruit and vegetable intake among children [108, 109]. The family is particularly important for socializing dietary behaviors [110], and therefore parental modelling of healthy eating, sibling intake, family connectedness, family structure, family meals, parenting styles, and parental support for healthy eating have all been shown to substantially influence children's

dietary behaviors [18, 19, 110]. Less frequent family meals are associated with lower quality diets [111] and higher weight status among children [112].

The media is among the most powerful of sociocultural influences on children's dietary behaviors, as colorful and seductive depictions of food in the context of desirable social environments can easily overwhelm rational intentions to eat healthfully. Studies confirm that food advertising affects children's requests and preferences for advertised products, and likely contributes to unhealthy eating and obesity [20]. The power of media can also be harnessed for good, as social marketing strategies that use commercial marketing techniques have proven an effective means of improving attitudes and self-efficacy for healthy eating as well as actual dietary behaviors within a variety of target groups and settings [113].

The potential of sociocultural environments to shape food choice is enormous, however actual interventions within sociocultural food environments are few. The Teens study was a multi-component school-based intervention that aimed to improve adolescents' dietary behaviors through environmental change, education and enhancing social support for healthy eating [114]. Results showed that students exposed to environmental change along with a peer-delivered classroom intervention and family component had better dietary outcomes compared to those in the control condition, or those only exposed to environmental change [114]. Other multi-component school-based studies that have engaged parents in intervention activities have also improved children's dietary behaviors, although it is not possible to determine the impact of parental involvement due to the multi-component nature of the studies [115, 116]. Increased knowledge of how sociocultural environments shape food choice can inform interventions to make healthier food choices socially acceptable and normative. Future interventions could provide more culturally appropriate foods, encourage authoritarian parenting styles, increase peer support for healthier eating, manipulate access to food-related media messages or facilitate family meals to support healthier dietary behaviors among children. Studies could also investigate whether changing children's perceptions of social norms surrounding fruit and vegetable intake supports their consumption [108].

1.4.4 Political environments

Governments occupy a unique and powerful position in relation to health and well-being by virtue of their ability to enact policies that establish the default conditions for the environments within which individuals live [117]. The political environment directly determines the content of all other environments, including physical, economic and sociocultural environments, making healthy policy a key antecedent to healthy dietary behaviors.

1.4.4.1 The political process

Policies are defined as a "relatively stable, purposive course of action followed by an actor or set of actors in dealing with a problem or matter of concern" [118] and can include both formal and informal rules, laws and regulations [119]. Policies, therefore do not only refer to mandated legislation, although in conventional usage and

throughout this thesis, the term will primarily be used to refer to formal, legally binding measures enacted by governments [120].

The process of policy making is poorly understood, and thus there are many, often conflicting, interpretations of the process. Various models have been proposed, including the Stages Model, the Advocacy Coalition Framework, Kingdon's Multiple Streams Model, the Garbage Can Model, and the Punctuated Equilibrium Framework [121, 122]. Policy making is a complex social process; different problems, inputs, stakeholders and settings are implicated in each instance of policy development. For this reason, no single model of policy making has proven to be universally applicable in all contexts and a linear progression between stages of policy making is rarely evident [121].

There is an inherent tension between evidentiary and political considerations during policy making, as scientists and policy makers employ different forms of rationality, leading to different interpretations of what constitutes relevant knowledge for policy making [123]. Scientists tend to operate within a positivist paradigm, which privileges knowledge gleaned from empirical investigations, and assumes that certain scientific facts can be objectively known and universally applied [123]. Evidence-based policy making assumes that empirical research can offer the best answers to most policy questions, reducing policy making to a matter of seeking and applying the best available evidence [124]. Policy makers, however, regard scientific evidence as only one piece of a much more complex 'political mess' of factors that should inform policy, such as public sentiment, economic realities, resource availability, political timescales and values [117, 123]. Thus, policy makers do not regard knowledge as universally applicable, but as situated and context-specific [123].

That scientific evidence should inform policy is self-evident, however the assumption that evidence is sufficient to inform policy is not consistent with the realities of policy making [125]. Science is perhaps best able to answer questions regarding discrete program choices [121], but cannot inform the value-laden judgments that must be made about how to prioritize scarce resources [125]. Thus, policy making is more than a matter of determining 'what works', but entails complex decisions about societal priorities and values [125]. It is perhaps best characterized as a discursive process of incremental decision making that relies on subjective judgment to make context-sensitive choices in the midst of uncertainty and competing values [124, 126].

Governments have a variety of policy options available to them. The Nuffield Ladder of Interventions (Figure 1.2) depicts government policy options on a continuum from relatively less to more coercive options [127]. Interventions higher up the ladder are more intrusive and accordingly require more justification, however the choice to do nothing is in itself a policy and must also be justified [117]. Governments commonly prefer to enact the least coercive measures, however as the history of seat belt and tobacco legislation shows, when measures lower on the ladder prove ineffective, governments may progress up the ladder, employing incrementally more coercive measures [117].

1.4.4.2 Benefits of policies to address unhealthy dietary behaviors and obesity

Public policy has potential to be particularly effective when it comes to improving population-level dietary behaviors and body weights. By enacting policy, governments can effectively and equitably address underlying environmental risk factors that make unhealthy dietary behaviors and obesity increasingly common within a population, with little effort on the part of individuals [128]. Compared to individually targeted dietary interventions, population-level nutrition policy can offer larger and more sustained benefits for population health, and at a lower cost to society [129, 130]. Policies can be targeted very broadly to the entire population, or alternatively to high-risk target groups. Policy is also enduring because it codifies change and survives transitions in leadership [131]. As such, it can become incorporated into social norms. Thus, the power of the law lies in its capacity to drive positive change within the sociocultural, economic and physical environments that shape individuals' dietary behaviors, making political environments key environmental targets for obesity prevention initiatives.

1.4.4.3 Rationale for government policy to address unhealthy dietary behaviors and obesity

Although policy measures have been used to successfully address important public health problems, nutrition policies are often opposed due to fears of excess government intervention in the lives of individuals. A clear rationale exists, however, for government intervention related to dietary behaviors and obesity.

Standard economic theory posits that individuals make decisions to maximize their self-interest, subject to constraints [89]. Therefore, if individuals were primarily or solely interested in improving their health, obesity would not exist and individuals would spend most of their time and money attempting to enhance their health [89]. In reality, however, individuals sometimes sacrifice health to obtain other things they value [132]. Obesity may therefore be the consequence of the trade-off individuals make between health and other desirable goals [89]. It is difficult to argue, however, that individuals are consciously *choosing* to be obese. On the contrary, evidence from the weight loss industry indicates that individuals would strongly prefer *not* to be obese. Thus, other factors must be overwhelming rational decision making. When the choices of individuals are inconsistent with their own self-interests, a market failure is indicated, and government intervention is justified to correct these failures [133].

Three market failures justify government intervention in the case of dietary behaviors and obesity [132]. First, although there is a general awareness of which foods are unhealthy, pervasive informational deficits remain [132]. Nutrition information is not available in all contexts, and when it is, consumers have difficulty comprehending and applying the information. Deceptive advertising practices used by industry furthermore reduce consumers' ability to evaluate and apply nutrition information in a rational manner [132]. Children, in particular, are highly susceptible to manipulation from marketing practices, yet play a significant role in food purchasing decisions. Second, negative externalities exist, whereby the costs of unhealthy diets and obesity have been imposed on all of society, although responsibility for creating the problem primarily rests within certain sectors [132]. The aggregate costs of obesity in Canada, for example, are largely borne by a publicly funded health care system, and are also

imposed on all of society through higher health and life insurance premiums and reduced economic productivity at a national-level, among others. Third, government regulation is also justified when individuals are not behaving in a rational manner [132]. Evidence indicates that food-related decision making is primarily automatic and environmentally cued, with little or no cognitive involvement [79]. Therefore, although individuals may wish to eat healthfully, unhealthy environmental cues may lead them to do otherwise. Governments have a role in assisting individuals to act in their own long-term best interests [133].

The concept of public stewardship suggests that government has a responsibility to provide conditions that allow its citizens to be healthy [134] and to control the medical and social costs of unhealthy behaviors that are borne by society at large [135]. Canadians have acknowledged that government should intervene to protect the public's health in many areas. As such, regulation has been used to address public health problems such as tobacco use and road accidents. Such protections should extend to protecting consumers from foods that may be just as injurious to their health. Children in particular require societal protection, as they have limited nutritional knowledge, cannot perceive the long-term health consequences of their behaviors and are easily influenced by marketing. The costs of government intervention are likely to be low relative to the excess health care costs that would result from inaction.

1.4.4.4 Policy initiatives to address unhealthy dietary behaviors and obesity

Despite the recommendations of expert panels and health reports [136, 137], a clear rationale for government intervention, and a precedent of government intervention in areas of public health importance, few obesity and nutrition-related policies have been enacted. Canada, in particular, has relatively little legislation to support healthy dietary behaviors and body weights [138]. The US has made more progress, however it too lacks a core of robust and effective policy measures, as does the European Union [139, 140].

Notably, it is not only the limited number of policies that have been enacted, but also their type that is concerning. Capacci et al [139] reviewed the nature of, and efficacy of existing policies undertaken by national governments in the European Union to promote healthy eating. Policies were divided into 3 broad categories. The first, policies intended to support informed choice through education or information, included measures such as advertising controls, public information campaigns, nutrition education programs, nutrition labelling and menu labelling [139]. The second, policies designed to change the market environment through altering food availability or prices, included fiscal measures such as food taxes and subsidies, regulation of the nutritional content of meals in schools and workplaces, nutrition-related standards (eg. trans fat bans), government encouragement of private sector action, availability measures for disadvantaged consumers and liability laws ascribing responsibility for adverse health outcomes to producers [139]. The final category of food-related policies evident within the European Union encompassed policies not specifically targeted at healthy eating but that nevertheless could impact dietary behaviors, such as differential tax rates on different types of foods, agricultural subsidies and tariffs, and poverty and redistributive policies [139].

Application of this classification scheme showed that policies within the European Union were overwhelmingly intended to promote informed choice, primarily through public information campaigns and providing nutrition education in schools [139]. Relatively few policies were directed at market environments, and those that did were predominantly concerned with increasing the availability of healthy foods in schools [139], a conclusion also reached in a review of United States (US) obesity prevention legislation [120]. Similar findings emerged from a survey of OECD countries [141], and from a review of government strategies to support healthy eating in away-from-home settings enacted in the European Union, Australia, the US and Canada [142]. A more optimistic picture emerged from an analysis of healthy living initiatives implemented in British Columbia and Ontario between 2006 and 2011, which showed that approximately half of the initiatives in each province targeted environmental or structural factors, with the remaining 50% focusing on individual-based lifestyle interventions [143]. Notably, however, there was a paucity of initiatives in both provinces that addressed healthy eating and active living through action on the social determinants of health [143].

As in the European Union, nutrition policies in Canada are predominantly 'soft' measures that address informational deficits and make individuals responsible for making better choices (eg. nutrition labelling) rather than 'harder', comprehensive structural, regulatory and fiscal interventions to alter environmental defaults. Examples of Canadian policies directed at market environments include school nutrition policies, the Quebec ban on advertising to children, and trans fat restrictions in some municipalities. Notably, none of these policies have been enacted on a national-level. The US has made several notable achievements at the federal-level, with initiatives such as the Affordable Health Care Act which will require menu labelling in restaurants and similar retail establishments with > 20 locations nationwide [144], the Healthy, Hunger-Free Kids Act of 2010 which introduced more rigorous standards for the National School Lunch Program [145], the Women, Infants and Children program which provides nutritious food and education to at-risk women and children [146] and the Supplemental Nutrition Assistance Program which provides food vouchers to vulnerable families [147]. There are also numerous strong state-level initiatives to improve school food environments and evidence of municipal action, most notably in New York City, through initiatives to ban trans fats in restaurants, require menu labelling and its recent attempt to limit portion sizes of sugar sweetened beverages.

The relative abundance of informational policies, and the relative lack of nutrition policies that address market environments suggests that many current nutrition policies are not informed by ecological approaches to health behavior change. Indeed, nutrition and policy experts believe that although market-based policies are likely to have the greatest impact in preventing childhood obesity, they are politically infeasible, whereas informational and educational policies are regarded as feasible but much less effective [148]. These expert assessments coincide with the beliefs of policy makers themselves, as Australian state-level policy makers expressed support for regulating food marketing to children and setting nutritional standards for government food services, but not for interventions within the food production and retail sectors due to interference in the

market-based economy [149]. At the local-level, policy makers did not see any role for local governments in enacting policy changes to promote healthy eating due to a perceived lack of relevance, and competing priorities that were regarded as more urgent [150]. In Alberta, decision makers expressed strong support for informational measures and those intended to improve children's food environments, with less support for broader fiscal measures and junk food bans [151]. Thus the stated, and observed reticence of governments to enact high-impact, market-based strategies suggests that political considerations have largely prevailed over science in setting nutrition policy.

1.4.4.5 Barriers to enacting policies that address unhealthy dietary behaviors and obesity

Calls for strong regulatory intervention must, however, be tempered by an understanding of the practical realities of policy making [150]. Policy making is complex, and not simply a matter of translating research evidence into policy, as it is subject to social and political influences [150]. Policy makers must contend with the competing values, interests and priorities of various stakeholder groups and their notions of what constitutes appropriate evidence for policy making. Just as eating decisions are prone to distortion from environmental forces, so too are the decisions of policy makers subject to distortion by contextual forces [152]. Opposition from industry and consumer groups can easily derail childhood obesity prevention policy [153]. Effective regulation of nutrition-related market environments presents particular challenges, as there is no historical precedent for such action, and thus policy makers may not recognize a role for government in this area and the structures necessary to enact such legislation may not exist [150].

Obesity policy making has been described as a 'policy cacophony', with different analyses and policy solutions clamouring for funding and support, leaving policy makers unsure how to proceed [154]. The current overreliance on individualized approaches may stem in part from the difficulty of enacting the comprehensive, systemic changes that are advocated, as it is much simpler to encourage individuals to choose healthier foods, rather than to fundamentally reshape decades-old agricultural, manufacturing and economic policies. Informational policies may be easier to implement because they are often within the remit of a relatively small number of departments/sectors, whereas market-based policies implicate many players with competing agendas.

Another important barrier to enacting strong nutrition policies is the framing of obesity as an individual problem, and the consequent disparagement of legislative interventions designed to change market environments as paternalistic intrusions on individuals and free markets. This view is largely propagated by a food industry that prioritizes economic over health concerns [149]. By comparison, informational strategies may be easier to enact because they accord with traditional North American values emphasizing personal responsibility, and may have the support of the food industry [148]. Imposition of new public health policies creates new demands that will necessarily compete with existing policies for scarce resources, thus resource limitations are also important barriers [155]. In addition, policy makers cite lack of evidence as a barrier [149, 156], a barrier likely to be most significant for policies to change market

environments since few have been implemented and evaluated. Ries and von Tigerstrom [138] identified 3 barriers to laws for healthy eating and activity with particular salience within the Canadian context, suggesting that Canadian legislators might be reluctant to enact hard hitting legislation due to concerns about their legislative authority to act, ideological opposition to 'nanny state' interventionism, and uncertainty regarding the impact of legislation.

Other barriers concern the reality that political timelines are short, while many of the benefits of nutrition and obesity policies may take decades to materialize. In particular, interventions targeting children, such as school-based health promotion and limiting child-directed advertising are unlikely to have any meaningful effects at a population-level for at least 40-50 years following their implementation [84]. Benefits of policy may also be difficult to show. Rates of chronic disease, for instance, may decrease in younger age groups, however these reductions may be offset by a rise in chronic disease in older age groups, because interventions tend to delay disease, rather than prevent it altogether [84]. By preventing or delaying disease, interventions may actually increase medical expenditures because of enhanced survival, although such increases can be offset if savings are realized in younger age groups [84]. It is furthermore difficult to attribute health gains to the impact of particular policies, and the impact of policies that successfully prevent or delay disease can go unnoticed, as events that do not occur are less salient.

Two of the most salient barriers to enacting effective healthy eating and obesity policies are opposition from the food industry and the lack of evidence of policy efficacy. Given that these topics are a major focus throughout this thesis they are elaborated in subsequent sections.

The food industry as a barrier to enacting policies to address unhealthy dietary behaviors and obesity

It is widely acknowledged that success in obesity prevention will require cross-sectoral initiatives and partnerships, however the appropriate role of industry in such initiatives is disputed. Possible models for engagement with industry include self-regulation, public-private partnerships and government regulation [157]. The fundamental mismatch between the food industry's profit motive and public health goals suggests government regulation of the food industry's activities may be essential because industry has an imperative to put economics before health [157]. The failure of self-regulatory schemes to meaningfully change food industry practices, and evidence that the food industry has employed tactics similar to 'Big Tobacco' (eg. biasing research findings, co-opting policy makers and health professionals, lobbying public officials and focusing attention on educational and physical activity-related approaches over strong nutrition regulation) supports this position [133, 158, 159].

Neo-liberal governments are, however, reluctant to regulate industry actions, and tend to allow the concerns of industry to take precedence over public health goals [160, 161]. Governments often defer to industry concerns during policy making because of its dominant role in the national economy, as a major employer and as a provider of financial credit to government [162]. Jenkin et al [163] highlighted this reality in an

exemplary analysis of the written and oral submissions from industry and public health stakeholders to the New Zealand Health Select Committee Inquiry into Obesity and Type 2 Diabetes, the resulting Committee recommendations, and the official government response to these. The positions of industry and public health on 17 of the 19 Committee recommendations were in opposition, however the government's overall position aligned with that of industry [163]. Concurrence between government and public health positions was only observed in the area of school nutrition policy, but on this issue industry was also largely in agreement with the public health stance [163].

The food industry controls and shapes the food supply and primarily determines which foods are available, accessible and marketed. Although industry has the power to improve food environments, it reaps substantial profits from the sale of processed, nutrient-poor, energy-dense foods, and therefore has little incentive to do so. This may be changing, however, as the Hudson Institute has repeatedly demonstrated a positive impact of lower calorie and better-for-you foods and beverages on overall sales growth [164-166]. Specifically, they showed that consumer packaged goods companies with a higher proportion of their sales in lower calorie foods perform better financially, with stronger sales growth, higher operating profits, superior shareholder returns and better company reputations than those selling fewer of these products [164]. A subsequent analysis confirmed that selling healthier items is indeed good for business, as restaurants that increased lower calorie offerings experienced an average 5.5% increase in same-store sales, whereas chains that reduced lower calorie offerings saw a 5.5% decline [165]. Lower calorie items were key to growth for the 21 national restaurant chains investigated, and those that increased their provision of lower calorie foods had superior increases in same-store sales, customer traffic, and in overall restaurant servings compared to other chains [165].

Large players within the food industry are beginning to recognize market opportunities related to the sale of lower calorie items. Members of the Healthy Weight Commitment Foundation recently pledged to eliminate 1.5 trillion calories from the marketplace in the US by 2015, through reformulating existing products and introducing new lower calorie items [167]. Lower calorie items now account for just over one half of the dollar sales of consumer packaged goods companies within the Healthy Weight Commitment Foundation, and these products drove a disproportionate share of their overall sales growth between 2006 and 2011, accounting for 82% of growth [166]. Moreover, firms appear to have met their caloric reduction pledges [167]. Despite this progress, these caloric reductions amount to 2% of all calories produced by companies, and 14 calories per day for the average consumer [168]. Furthermore, lower calorie items are not necessarily healthy, as reformulated items are sometimes merely healthier junk foods [169].

Industry opposition to government regulation of the food supply and of food environments continues to present a formidable barrier to effective policies to improve dietary behaviors and prevent obesity [153]. Furthermore, the food supply remains overwhelmingly unhealthy. Although progress is being made, it is possible that the actions industry has taken may partially be a tactic intended to project an image of

action in order to stall government regulation. Thus, more meaningful efforts on their part will be needed to improve population-level dietary behaviors and body weights.

Lack of evidence as a barrier to enacting policies to address unhealthy dietary behaviors and obesity

Policy makers cite lack of evidence as a barrier to developing nutrition and obesity-related policies [149, 156]. Rigorous policy evaluations have rarely been conducted, however, due to the difficulty of obtaining reliable data [139]. Following a comprehensive review of nutrition policies within the European Union, Capacci et al [139] noted that while evaluations have been undertaken for many policies, conclusive evidence was not found for the effectiveness of any policy measures, due to a limited number of studies, the limited scope of policy actions, poorly designed studies, and heterogeneous findings. Acknowledging these limitations, the evidence was strongest for a positive impact of nutrition labelling and regulating advertising to children on dietary behaviors, with smaller behavioral responses to small fiscal measures [139].

Evidence from the broader literature is also instructive regarding the efficacy of nutrition policies in improving food environments, dietary behaviors and body weights. School food policies are among the most widely studied nutrition policies. There is strong evidence substantiating that school nutrition policies are associated with improvements in school food environments and children's dietary intakes and body weights [46, 49, 51, 54-56, 68, 170-178], although there are conflicting data with respect to impact on body weight [171, 179-181]. A key finding from this literature is that the efficacy of nutrition policies depends upon policy strength. Strong nutrition policies are those that contain specific, required standards [177, 182]. Such policies are more likely to be fully implemented than those written with weak language [177]. When enacted in schools, data suggest strong policies may translate into improved dietary and body weight outcomes. Students in states with more strict standards governing competitive foods (typically energy-dense, nutrient poor 'snack' foods) consumed fewer calories, fat and sugar at school [55] and gained less weight [182] than students from states with no, or weaker standards. Similar findings were seen among students in states with strong meal standards compared to those with weaker standards [41, 66]. Strong policies also ameliorated disparities in body weight between students from high and low-income homes [66], and disparities in fruit and vegetable intake arising from low in-home fruit and vegetable availability [41].

Nutrition labels on pre-packaged foods have also been studied extensively. Studies show a clear association between nutrition label use and healthier dietary behaviors [183]. Evidence also indicates that consumers perceive nutrition labels to be a highly credible source of information and many use them to inform product selection [183]. Label use varies considerably across subgroups, however, and some groups find aspects of labels difficult to understand [183]. Similarly, the impact of menu labelling in New York City and King County, Washington has also received considerable attention. Findings are mixed in this respect, with some studies showing small reductions in caloric intake [184-186] others no change [187-189] and others slight increases in caloric intake in response to menu labelling [190]. Although nutrition and menu labelling are informational approaches, they have the potential to impact the market environment

through food reformulation. A controlled pre-post analysis of the impact of the Nutrition Labeling and Education Act on product nutritional content found that firms actually reduced brand nutritional quality in response to the regulations, presumably because consumers perceive that more nutritious foods are inferior in taste [191]. Similarly, although the proportion of healthier food options on menus from some major fast-food chain companies increased slightly following menu labelling legislation in select US cities and states (from 13% to 18%), average nutritional values for the menus as a whole remained unchanged [192]. Another study found modest improvements in the nutrient content of foods available at sit-down and quick-serve restaurants (eg. 7% reduction in calories) following mandatory menu labelling in King County, Washington [193].

Downs et al [194] concluded that national and local bans on trans fats have been very effective, virtually eliminating trans fatty acids from the food supply. Compensatory increases in the saturated fat content of products are not evident [194]. Mandatory labelling of trans fats in Canada and the US has been less effective [194], but appears to have reduced trans fat intakes, although they remain above recommended levels [195, 196].

Although there are many studies of fiscal measures to improve food environments, most are model simulations or intervention studies that do not examine actual policy outcomes [197]. Indeed, despite its potential, the use of food taxation as a health policy instrument has been limited. Examples include France's tax on sugared soft drinks, Hungary's tax on some snack foods and beverages, Finland's tax on sweets, and Denmark's saturated fat tax [197, 198]. Jensen and Smed [197] evaluated the impact of the Danish tax on saturated fat which was part of a more comprehensive upward adjustment of existing taxes on sweets, chocolate, sugar products, ice cream, soft drinks, as well as alcohol and tobacco [197]. The Danish tax was paid on the weight of saturated fat in foods that exceeded 2.3g saturated fat per 100g and was levied on food manufacturers and importers, with the expectation that it would be passed onto consumers [199]. Nine months following introduction of the tax, purchase of the foods most likely to be affected by the tax such as butter, butter-blends, margarine and oils, dropped by 10-15% [197]. There was also a shift in demand for these items from high price supermarkets toward low price discount stores [197]. Different results might be expected over the long-term, however, as formation of new dietary patterns in response to price change takes time, and as food reformulation occurs [197]. Notably, the tax has since been repealed due to adverse economic impacts on producers and retailers [200].

Other fiscal policies that have been examined include the small taxes of 1-7% that more than 30 US states levy on sodas [201]. The low tax rates and the small variations between states have precluded robust analyses, however, and thus there is only weak evidence that soda taxes may reduce soda consumption and BMI [67]. Also in the US, the Women, Infants and Children Program (WIC) provides supplemental foods, nutrition education and medical referrals for low-income pregnant and post-partum women and infants who are at nutritional risk [146]. The program has been evaluated extensively and has proven to be highly cost-effective in improving the dietary behaviors and health

of participants [146]. In 2009, revisions to better align the types of products eligible for purchase with the Dietary Guidelines for Americans came into effect, including a reduction in the juice allowance by approximately one-half, provision of vouchers for fruits and vegetables, reduced fat content of dairy foods and the addition of new whole grain products [202]. WIC-approved stores are required to carry the new healthy foods, and assessment of the availability of healthy foods confirmed that availability of healthy foods in WIC-approved stores increased within 6 months of implementation of the new rules, particularly in lower-income areas [203]. This simple policy change therefore reduced disparities in availability of healthy foods and improved the availability of healthy foods for all consumers [203]. Moreover, the changes appear to have improved the food purchases of WIC participants, increasing the purchase of whole-grain bread (from 8% to 24% of bread purchases) and brown rice (from almost zero to 30% of rice purchases) [204], and reducing juice purchases by a quarter, reductions that were only partially compensated for through an increase in juice purchases using non-WIC funds [205]. Decreased juice purchases were also not offset by increased purchase of sugar-sweetened beverages [205]. A pilot project that reimbursed members of the US Supplemental Nutrition Assistance Program 30 cents for every dollar spent on fruits and vegetables has also been successful, increasing consumption of fruits and vegetables by 25% compared to controls [206].

Government policies encouraging voluntary action by industry have been effective in some areas, such as in the United Kingdom, where a national strategy to reduce population-level salt intake anchored in voluntary reductions by industry has reduced population-level salt intake by 0.175 g/d/y [207]. Voluntary labelling schemes that allow products meeting nutritional criteria to carry a health logo have also had some success in incenting product reformulation [208, 209]. Conversely, limited progress has been achieved in reducing children's exposure to advertising of less healthy foods through industry self-regulation [210]. Government regulation of industry marketing practices to children may be a more effective policy approach although the data are limited in this respect [210]. There is some evidence to suggest the Quebec ban on marketing to children may influence the food expenditures of French speaking households, making them less likely to purchase children's cereals [211] and fast foods [211, 212]. At the school-level, however, Riis et al [213] did not find any cross-sectional associations between state-level laws governing marketing in schools and youth obesity prevalence.

In addition to impact evaluations such as those described above, process evaluations of nutrition and obesity-related policies are needed to evaluate the extent to which policies are implemented as intended in order to distinguish policy failure from implementation failure. In this respect, the fidelity-adaptation debate remains controversial, with adherents of fidelity contending that fidelity is key to the success of policy, while others counter that sustainability is increased through allowing adaptations [155, 214]. In practice, adaptations should be expected, as the creators, adopters and implementers of policy are often not the same individuals [155, 214]. The creators and adopters of policies, in particular, tend to be higher level individuals with limited understanding of how policies will be operationalized. Differing values and priorities among these groups may influence how policies are prioritized, interpreted and ultimately applied [155]. Practical considerations may also compel adaptations, as the

imposition of public health policies creates new demands that will necessarily compete with existing policies for scarce resources [155].

Although evidence cannot determine an unproblematic course of action [124], it is nevertheless important to inform policy decisions. Many opportunities to use research evidence within policy decisions are currently being missed, however [215-217]. This failure is often attributed to limited communication, exchange and understanding between researchers and policy makers [215]. Strategies that might help to increase the use of research in policy include: 1) Making research findings more accessible, such as through brief summaries posted on websites; 2) Increasing opportunities for knowledge exchange and partnership between policy makers and researchers; 3) Addressing structural barriers by, for example, including engaged scholarship as a metric for evaluating and promoting researchers; and 4) Conducting more policy-relevant research, something that might be accomplished through involving policy makers in the research process [215]. The full impact of policies can never be known in advance, however, given the unique contexts in which individual policies are implemented. The ability to attribute improvements in dietary behaviors and body weights to particular policy measures is also limited. Thus, no matter how much evidence is sought, policy makers will always face uncertainty with respect to the evidence base, and must always be careful not to confuse lack of evidence with evidence of no impact.

1.4.4.6 Characteristics of efficacious nutrition and obesity-related policy

Policy efficacy is a function of policy strength. Strong nutrition policies have been characterized as those that contain strong, prescriptive language, using words such as 'shall' and 'must', as opposed to weaker terms such as 'should' and 'try' [177, 182]. Strong policies also contain specific nutrition-related standards as opposed to vague references to 'healthier foods' [177, 182]. Strong policies are more likely to be fully implemented [177], and are associated with improved dietary behaviors and lower BMI in children [41, 55, 66, 182]. In some instances, the impact of weak policy is equivalent to having no policy at all [182]. An example of a weak policy approach is evident in the US federal Child Nutrition and Women, Infant and Children Reauthorization Act of 2004 which required local school districts to establish school wellness policies by 2006 [218]. While this approach allowed schools to tailor policies to their unique needs [219], it led to weak school nutrition policies because it did not mandate compliance with certain minimum standards [220-224]. Nutrition policies at the school-level are similarly weak in US states that have weak state-level nutrition policies [225], but they are strong in states with strong school nutrition policies [225]. Thus, these observations suggest weak policies have little impact and may beget additional weak policies.

Effective nutrition policies are also comprehensive. Policies that restrict availability of a limited number of foods and beverages may not improve dietary behaviors because children may simply substitute available unhealthy items for those now banned, as occurred when soda but not other sugar sweetened beverages were banned from some US schools [65]. Similarly, policies must apply to all sources of unhealthy foods within a setting, as those that apply to school snack bars but not to vending machines, for instance, have little impact on children's dietary behaviors [226]. Policies enacted within single settings such as schools are also not ideal, as there is potential that

children may simply obtain unhealthy items elsewhere thereby limiting their effectiveness, although the data are mixed in this respect [46, 49, 54, 55, 65-67].

School wellness policies with the following components: goals for nutrition education, nutrition guidelines for all foods available, a policy implementation plan and involvement of multiple stakeholders in developing and implementing policy are associated with better school food environments, suggesting that the process of developing and implementing policy may be just as important as the final guidelines [176]. It may be that when stakeholders are involved in policy development they are more likely to adhere to them and promote their use. Furthermore, quality and effectiveness of policy implementation depends upon organizational capacity, supports for implementation, and accountability measures [227]. Monitoring is especially critical, as when compliance is not monitored regularly, or when there are no penalties for non-compliance, adherence to policies is suboptimal [60, 228].

1.4.4.7 Unintended consequences of policies to address unhealthy dietary behaviors and obesity

Policy should not be expected to yield uniformly positive outcomes, and thus potential unintended consequences should be considered *a priori*. Policies will inevitably lead individuals and organizations to adjust their behaviours in numerous, often unforeseen ways that can reduce, eliminate, or even reverse the intended effects of policy [229]. The benefits and costs of policy and associated compensatory responses might be differentially distributed across sectors, and thus it is important to ensure all relevant stakeholders are included in decision making processes and to ensure alignment of their respective agendas [230]. Health Impact Assessments can help to determine where policy losses and gains might accrue. Neglect of these critical processes increases the risk of unintended negative consequences from nutrition and obesity-related policies, examples of which are provided below.

- Taxation of unhealthy foods has the potential to be regressive, as lower income consumers spend a greater share of their income on food, and tend to purchase relatively higher amounts of unhealthy foods [97-99]. Some of these negative consequences may, however be offset by the fact that these households also tend to have a higher prevalence of diet-related illness [100, 101].
- Subsidies have the potential to increase spending on unhealthy foods by freeing up additional disposable income [231].
- There is potential that school nutrition policies might increase rates of eating disorders, or lead to stigmatization of obese students.
- Restrictions on unhealthy foods in some settings could lead to increased intake of unhealthy foods in others through a phenomenon termed reactance, whereby individuals react negatively to regulations that limit choice [232].
- Interventions within the food environment might negatively impact health equity when applied at a population-level if consideration is not given to existing disparities that limit the ability of some vulnerable populations to respond to some public health interventions [233].
- Reformulated foods might not be healthier if alternative ingredients reduce the food's nutritional profile, such as when the sugar content of low fat foods is

increased to offset changes in taste due to fat reduction. In some cases reformulated items might merely be 'healthier junk foods' [169].

- Nutrition labelling can lead to lower brand nutrition when the disclosure concerns an attribute that consumers perceive to be negatively correlated with taste [191].
- The financial profitability of industry, community organizations and governments might be reduced if there is limited consumer demand for healthier items.
- Studies have documented a 'health halo' effect of labelling items as healthier, in which individuals underestimate the caloric content of items that are perceived to be healthy and also overconsume them [234, 235]. Even the mere option of healthier items on menus can paradoxically lead to caloric indulgences [236].
- Nutrition policies can negatively impact global equity. Higher income nations may reap greater health benefits from adhering to dietary recommendations compared to lower-income nations, for reasons related to differing dietary patterns, agricultural production, trade and other economic factors [237].

1.4.4.8 Policy prescriptions to address unhealthy dietary behaviors and obesity

Policy solutions to improve dietary behaviors should focus on investing in infrastructure that simultaneously enables the global food economy to contribute to social welfare, while maximizing economic growth [15]. Hawkes [15] suggests this can be accomplished by policies that target consumers, the consumer food environment and the food system [15]. First, consumers should be provided with the knowledge and skills to select healthy foods, thereby generating demand for healthy items [15]. Second, because consumers will not always prioritize health in food-related decision making, policies are needed to improve the consumer food environment, such as through improving the availability and nutrient content of healthy foods [15]. Third, the supply side of the food system must also be addressed through incentivizing production of healthier foods [15]. Together, policies targeted at consumer food environments and the food system provide structural supports for consumers to make healthy food choices.

While Hawkes' policy prescriptions are undoubtedly sound, ultimately, the challenge lies in moving beyond case-by-case policy prescriptions to address emerging health crises such as obesity, towards a comprehensive system of health-in-all policies consistent with the principles espoused in the Ottawa Charter for Health Promotion [238]. In Canada, there persists a notion that health is a function of adequate health care, and that responsibility for health resides solely within ministries of health. A wider conceptualization of health is needed, as many policy levers for dietary change lie outside the health sector. Little benefit can be gained, for example, by recommending change in fat consumption if agricultural policies support production of high fat commodities; yet the health implications of policy decisions made outside of ministries of health are often not considered. A vision for healthy public policy in Canada is one in which health is viewed as a public good, ranks high on the agenda of policy makers in all sectors and at all levels, is embedded as a central *a priori* consideration during all policy making, and where there is coherence and alignment of policies across all sectors to ensure that negative actions in some sectors do not undermine positive actions in

others [239]. Healthy public policies extend beyond those that target individuals and their environments to address the underlying reasons why individuals become poorly informed (eg. inadequate education) and their environments unhealthy (eg. agricultural policies) in the first place. Thus, a focus on changing individual behaviors and the environmental contexts for those behaviors is an interim expedient necessary only until the root causes of unhealthy behaviors and environments can be identified and remedied.

1.4.4.9 Settings in which to implement policies to address unhealthy dietary behaviors and obesity

School nutrition policies have improved child health, however the current focus on policy measures to improve school food environments has obscured the need for complementary and reinforcing policies in other settings. If unhealthy foods remain readily available, accessible and promoted in other contexts children may simply shift their consumption of unhealthy foods to these settings [46, 65], and indeed the lack of impact of school nutrition policies on body weight found in some studies highlights the need for comprehensive policies that apply in multiple environments to which children are exposed [179, 180]. Therefore, if change is to be realized, the successes achieved in school food regulation must be translated to other settings to ensure children regularly encounter healthy food environments and receive consistent health messages.

Sports settings have been identified as a setting in need of policies to address unhealthy dietary behaviors and obesity, as youth who participate in sport do not have lower body weights compared to non-participants [240]. The absence of a protective effect of sports participation on obesity has been attributed to excess caloric intake among youth sports participants, primarily from fast foods and sugar sweetened beverages [240]. Most of children's sports time is spent being sedentary or in light-intensity activities [241, 242], and thus youth may be overcompensating for relatively low levels of energy expenditure [243]. Time pressures associated with attending sporting events may furthermore increase reliance on convenient fast foods and processed foods [240, 244].

Recreational facilities as a setting for policies to address unhealthy dietary behaviors and obesity

Recreational facilities are an important setting for youth sport in Canada and have a mandate to promote health. Despite this mandate, however, recreational facilities in Canada appear to have unhealthy food environments [245-250] that may paradoxically increase obesity risk. In 2009, Chaumette et al [245] were the first to formally identify the problem of unhealthy food environments in Canadian recreational facilities when they evaluated the foods available in 47 recreational, sports and cultural facilities in Quebec. Similar findings in British Columbia published the following year led to the suggestion that, far from being health promoting, recreational facilities were in reality obesogenic environments for children and families [246]. Findings from self-reported food environment audits showed that recreational facilities (n=101) overwhelmingly sold unhealthy foods in their concessions and vending machines [246]. Recreation stakeholders were interested in making change, however they were concerned about the potential for lost revenue and indicated they would require training, implementation resources and supports for accessing healthy foods and establishing

health promoting partnerships with industry [246]. Thomas and Irwin [251] contributed the perspective of recreational facility patrons to this early literature, finding that recreational facility patrons in Ontario (n=269) strongly supported offering healthier items in recreational facilities. Operators of the same facilities reported poor sales of healthier options however, suggesting that patrons' and operators' perceptions of desirable healthy foods differed, or alternatively that patrons stated intentions were inconsistent with their actual behaviors [251].

British Columbia was the first province to formally address the problem of unhealthy food environments within the recreation sector, first through its voluntary *Nutrition Guidelines for Vending Machines in BC Public Buildings* [252], and subsequently through its *Healthy Food and Beverage Sales in Recreation Facilities and Local Government Buildings* initiative [253]. The latter initiative, now rebranded as *Stay Active Eat Healthy* [254], provides seed funding, technical support, training and resources for recreational facilities to voluntarily improve their food environments [246]. A formal evaluation of the program within 8 pilot communities showed that the program led to positive change within a short time frame, with a 19% increase in facility environment scores (the 3 areas addressed were strategic planning, supportive environments, and communication) and in healthier vending choices from baseline to the 6 month follow-up [246]. Notably, no facilities fully met the guidelines during the study time frame and patrons reported that their purchasing behaviors were unchanged following the improvements [246]. That improvements were relatively small despite the significant supports provided illustrates the immense challenge of improving food environments within the recreation sector, particularly in provinces where minimal or no supports exist. Key barriers to change included fears of revenue loss, the provisions of contracts, limited stakeholder buy-in and time constraints [246].

Given that many recreational facilities contract out their food services to private, for-profit operators, it is important to understand the food industry's perspective of nutrition guidelines and the most appropriate model for engaging them in efforts to improve recreational facility food environments. A study with industry representatives from British Columbia revealed that industry had 4 major concerns with respect to implementing nutrition guidelines: 1) Limitations in the guidelines such as being too restrictive, 2) Locating healthier products that were also desirable to consumers, 3) Competition from other businesses that did not comply with nutrition guidelines, and 4) Negative impacts on profitability [255].

Ontario was another early leader with its Eat Smart! program that provided formal recognition to recreational facilities that adhered to standards for nutrition, food safety and smoke free environments [256]. A process evaluation of a 6-month pilot project showed that facilities (n=16) made several changes to improve their food offerings, and most perceived their experience with the program as somewhat to very positive [257]. The provincial government is no longer coordinating the program's website which will become inactive in January, 2014, although municipalities have the option of continuing in the program on their own [258]. Other provinces, including Manitoba, Saskatchewan, Nova Scotia, New Brunswick, Newfoundland and Labrador have initiated more limited action to address recreational facility food environments through provision of online

resources, toolkits and in some cases dietitian support. Unpublished evaluations have highlighted the barriers and facilitators to changing the food environment in recreational facilities in some of these provinces, and suggest that although positive change is occurring, it is slow and considerable resistance exists [257, 259]. Table 1.1 summarizes Canadian provincial initiatives to improve recreational facility food environments.

In Canada, provinces have jurisdiction to pass legislation pertaining to municipalities, and can also grant municipal governments power to pass bylaws within their communities [260]. Thus, action to address recreational facility food environments can also be initiated by municipalities; and whereas there are no mandated nutrition policies for recreational facilities at the provincial-level, several municipalities have introduced such policies. In 2007, Lac-Etchemin, Quebec became the first Canadian municipality to ban junk food from its arena, however the ban was subsequently reversed in 2011 due to reported customer demands for unhealthy products [261]. Quebec City similarly decided to relax its anti-junk food policy in arenas due to revenue declines, as did the city of Gatineau [261]. In Toronto, a decision to stock vending machines in parks, forestry and recreational facilities with healthier beverages has been controversial due to estimates it will cost the city $1 million in lost revenue over 5 years [262]. The picture in British Columbia appears more promising according to a published report of a successful pilot program in 10 communities [247], and online testimonials [263]. The town of Esquimalt, British Columbia, for instance, has developed a comprehensive nutrition strategy with 33 specific initiatives intended to promote healthy eating throughout the community [264]. The City of Hamilton is an Ontario success story, with regulations stipulating that 75% of food and beverages offered in all municipal facilities (including recreational facilities) and at municipal events must be healthy choices that are trans fat free and competitively priced [265].

Canada's recreational facility model, with municipal funding of large, modern sports multiplexes appears unique in the world, and thus current investigations of recreational facility food environments are exclusive to Canada. Studies from the US, United Kingdom, Finland, Australia and New Zealand have, however, examined the nature of food environments in sport settings such as in sports clubs and stadia. These studies confirm that sport settings in other nations can also be very unhealthy [266], with high availability of unhealthy foods [244, 267, 268], few nutrition-related policies [269] and many barriers to change [270], particularly fears of reduced revenue [271, 272]. Patrons, however, express a desire for healthier foods [273, 274]. In one study, development and implementation of health promoting food policies in sports clubs increased the availability of healthier foods, although the extent and nature of these changes were not documented [269]. This literature has also addressed the contentious issue of sports sponsorship, finding that unhealthy food and beverage companies sponsor sport in Australia and New Zealand, although they represent a minority of sponsors [271, 275]. Moreover, sports officials and parents support restricting such sponsorships [276, 277]. As in Canada, efforts are underway within some of these nations to improve the health promotive capacity of sporting environments [266, 270].

Parents of youth involved in sport indicate that many of the meals and snacks consumed by their children in sports settings are unhealthy, and point to food availability as a key determinant of what their children eat [244]. Time pressures are significant in these families, and the pressure to enroll youth in organized physical activities appears to outweigh the importance of healthy eating, leading to neglect of family meals in favor of more convenient take-out options [244, 278]. Many parents of children involved in sport are concerned about their children's consumption of unhealthy foods, however others are not because their children are not overweight and are physically active [244]. These findings highlight opportunities to intervene within sporting environments to ensure availability of healthy options for time-constrained families.

The Alberta Nutrition Guidelines for Children and Youth

In response to the need to improve the food environment in Canadian recreational facilities, the Alberta government released the Alberta Nutrition Guidelines for Children and Youth (ANGCY) in 2008 [279]. These voluntary guidelines are intended to ensure children have access to healthy foods in schools, childcare and recreational facilities [279]. The ANGCY use nutrient-based standards to classify foods as 'choose most often' (consume daily), 'choose sometimes' (≤ 3 servings/week), and 'choose least often' (≤ 1 serving/week) [279]. 'Choose most often' foods are nutrient rich foods found in *Eating Well with Canada's Food Guide* that tend to be lower in calories, sugar, fat and salt [279]. 'Choose sometimes' foods still contain beneficial nutrients, but may be higher in calories, sugar, fat and/or salt [279]. Items in the 'choose least often' category are energy-dense and nutrient-poor items that are not recommended for consumption [279]. The ANGCY suggest that recreational facilities can support healthy eating among children by ensuring healthier foods are available, affordable, convenient, attractively packaged and prominently displayed [279]. The guidelines do not contain recommendations with respect to marketing of unhealthy foods within recreational facilities.

The initial dissemination of the guidelines was accomplished by mailing ANGCY resource binders to municipalities, presentations by government staff at educational events within the recreation sector and posting the guidelines on the internet [248]. In recent years, the nutrition standards for the guidelines have been updated, and additional resources such as healthy recipes and an online 'Food Checker' have been posted online. Regional Health Promotion Facilitators have also been hired to assist with ANGCY implementation.

Given the extent of the problem of unhealthy food environments in recreational facilities and the lack of mandated policy measures to improve them, it is important to examine how to support voluntary uptake of nutritional guidelines such as the ANGCY. Thus, this literature review concludes by discussing Diffusion of Innovations theory and how processes of diffusion might help to accelerate voluntary uptake of Alberta's nutrition guidelines for recreational facilities.

1.4.4.10 Policy diffusion

Diffusion of Innovations theory

Diffusion is the process by which an innovation is communicated over time among the members of a social system [280]. At its heart, diffusion is a social process, consisting of interpersonal network exchange and social modeling by adopters, to those who are influenced to follow their lead [280]. The process is initiated by a potential adopter who perceives a *need* for an innovation, and to reduce uncertainty about it acquires *knowledge* about it, and seeks the evaluative judgments of trusted and respected others [214]. Once a potential adopter is *persuaded* that the innovation can meet their needs, they *adopt* (ie. a mental decision to use an innovation) and *implement* (ie. put the innovation to use) the innovation, and seek *reinforcement* (ie. supportive messages) for the decision that was made [280]. Although often depicted linearly, this innovation-decision process is actually cyclical and iterative in nature [281].

Four main aspects of the theory are identifiable in all instances of diffusion: 1) An *innovation*, 2) is *communicated* through certain *channels*, 3) *over time,* and 4) among the members of a *social network* [280]. First, an innovation is an idea, practice or object that is perceived as new by potential adopters [280]. Attributes of the innovation, as perceived by potential adopters, account for a significant proportion of the variability in adoption rates [282]. In particular, innovations that are perceived to have greater relative advantage (effectiveness relative to current practices or other alternatives), simplicity and compatibility (fit with established ways of working) will be adopted more rapidly [280]. Observability (the degree to which the outcomes of the innovation can be observed) and trialability (whether portions of the innovation can be experimented with in a limited manner) are also important, although less consistently so [214].

Communication channels are the means of spreading an innovation [280]. Diffusion theory posits that the spread of innovations requires the activation of informational channels as well as channels of influence [283], as information alone is often insufficient to move individuals toward a positive adoption decision [214]. Rather, persuasion occurs in the context of social influence as potential adopters are motivated to seriously consider adoption when others within their social networks share how they are successfully using an innovation [214]. By enacting social influence, diffusion produces a highly efficient social multiplier effect; communicating an innovation to a small subset of potential adopters who will in turn catalyze adoption among others within their spheres of influence [214].

Time is a third important aspect to consider. Innovativeness describes the degree to which an individual is relatively earlier in adopting an innovation compared to the other members of a social system [280]. Diffusion tends to follow a predictable S-shaped pattern over time. Innovators (~2.5% of adopters) are the first to adopt, and do so because of novelty and having little to lose [214]. The next to adopt, early adopters (~13.5%), do so because they perceive the attributes of the innovation positively [214]. The early majority (~34%) adopt because others have done so and they feel it is the right thing to do [214]. The late majority (~34%) and the laggards (~14%) are the last to adopt, and generally adopt on the basis of perceived social pressure to fall in line [214]. Diffusion, as research and experience have demonstrated, is slow to occur, with some studies suggesting there is a substantial time lag of 8-15 years between the time technical information is generated and used in practice [284, 285]. Indeed, many well

studied health policies and programs can remain unimplemented after considerable development effort [286].

Finally, individuals, groups, and organizations can all be members of various social systems [280]. The structure of social systems, such as their norms, agents and the patterns of interactions among members all affect diffusion [280, 287]. Opinion leaders, champions, linkage agents and change agents are key individuals within social systems who play important roles in communicating and accelerating the spread of innovations [280, 287].

As the history of tobacco control demonstrates, processes of natural diffusion can be activated through mutually reinforcing messages, policies, incentives and social pressure for change [214]. Alternatively, diffusion concepts can be purposely operationalized in a manner that accelerates or slows spread of an innovation, as the case warrants [214]. Dissemination involves using active interventions to accelerate diffusion of an innovation. CATCH (A Coordinated Approach to Child Health) was a multi-component school-based health promotion program designed to improve children's dietary and physical activity behaviors that achieved widespread diffusion through strategic application of diffusion principles. The initial dissemination strategy, consisting of training, presentations, subsidies and mass mailings proved largely ineffective, resulting in uptake by only 6 schools [288]. These disappointing results led investigators to design a purposive diffusion strategy. Adoption of CATCH subsequently expanded from 6 schools in 1996-97 to over 1800 in 2004-2005, with reportedly high implementation [288, 289]. This widespread diffusion was largely achieved by identifying key organizations, decision makers, innovators, change agents and opinion leaders within the social system, and targeting dissemination activities to them [288]. Training materials and resources also highlighted the positive attributes of the program [288]. The experience of CATCH shows how diffusion can be accelerated through operationalizing diffusion principles and highlights the importance of interpersonal communication channels, over and above media channels, as vehicles for dissemination [288].

Diffusion of public health policies

For policies to have a broad and sustained impact at a population-level, they must be widely adopted. In the policy context, diffusion is a process whereby political bodies apply policy solutions from the experiences of similar jurisdictions [260]. It is more efficient for governments to learn from the experiences of other jurisdictions, rather than to develop their own novel policies for each specific issue, and thus policy diffusion is common and constitutes a key aspect of the political process [260, 290].

There is an evolving literature on the conditional nature of policy diffusion that examines factors that influence whether and how it occurs [290]. Shipan [290] describes 4 main mechanisms of policy diffusion: learning, competition, imitation and coercion. The first and most common is learning, whereby policy makers observe the impact of policies in other jurisdictions [260]. Such policy learning is increasingly evident in the current context where barriers to communication and travel are low [290]. Competition can occur when local governments offer policies that are attractive

to residents they wish to attract or retain, such as when a city that finds its residents moving to other jurisdictions for better schools responds by improving its own educational standards [290]. Policy imitation arises when one government copies anothers' policies without considering whether the policy is truly appropriate for their own context, often leading to inappropriate policy choices [290]. Finally, coercion involves the use of force, threats or incentives to influence the policy choices of another government [290]. Grants given in exchange for policy compliance are one example of a coercive strategy [290]. The importance of the various diffusion mechanisms differs at each stage of the policy formation process, for different types of adopters (eg. early vs late majority), according to political circumstances, the particular networks in which governments are embedded, and the policy making capacities of a particular jurisdiction [290]. The characteristics of policies, including their relative advantage, complexity, trialability, observability and compatibility also influence policy diffusion [291]. Complex policies, for instance, spread more slowly and are less likely to diffuse through learning-based mechanisms [291].

History provides several examples of successful diffusion of health policy. Policy diffusion was an important process underlying the spread of smoke-free spaces [260], and mandatory seat belt legislation. Several nutrition policies have also diffused. The movement to ban trans fats began in 2004 in Tiburon, California, for instance, and spread to many American cities and states and to other nations [292, 293]. Policy diffusion has led to the spread of nutrition policies among schools, accelerated by rising public concern about obesity [294, 295]. The 2010 national health care reforms in the US built on some aspects of municipal and state policies, such as menu labelling which was originally introduced in New York City. There is also some evidence of limited diffusion of municipal nutrition policies in the recreation sector as previously described, and of nutrition initiatives in British Columbia recreational facilities, as 68 facilities were purportedly reached by project activities carried out in only 10 communities [246].

Notably, diffusion of all of these nutrition policies has been incomplete, and there remains considerable variability in the strength and comprehensiveness of those that have achieved more widespread implementation [296, 297]. Even in schools, for which there is considerable evidence of positive outcomes from strong policies, significant differences exist in the quality of the policies that have been developed and implemented [298, 299]. That policy diffusion can stall despite evidence of benefit, that it is accelerated by public concern about obesity, and that there should be significant heterogeneity among policies, highlights the influence of contextual factors in nutrition policy diffusion. Diffusion constitutes a form of experiential evidence that might be considered during policy making, however it is only one of many inputs into the policy process, and its importance will differ in each situation according to contextual factors such as political, social and geographical considerations [260].

1.5 Summary

Policy makers often lack the answers to the key questions that arise during policy making [300]. If policies are to be adopted and implemented, and diffuse among jurisdictions, then rigorous evaluation of their implementation and effectiveness is essential. This review of the literature has presented a model for thinking about 4 types

of environments that might influence dietary behaviors: physical, economic, sociocultural, and political. The political environment was identified as a particularly important point of intervention, by virtue of its ability to shape the physical, economic and sociocultural environments that condition the dietary behaviors of entire populations. The political process and opportunities to influence child health through policy were therefore explored in an in-depth manner, noting the barriers to policies, along with examples of current policies and their impacts. Through this discussion it became apparent that few nutrition-related policies have been implemented, particularly those targeting market environments, and of those that have been implemented, relatively little is known about their impact. Recreational facilities were presented as a possible setting for nutrition policy to ameliorate their very unhealthy food environments. A single study has attempted to intervene in this setting, with some small improvements achieved. Finally, Diffusion of Innovations theory and policy diffusion were discussed, with a view to leverage processes of diffusion to accelerate voluntary uptake of Alberta's nutrition guidelines for recreational facilities.

1.6 Tables

Table 1.1 Summary of Canadian provincial initiatives to improve the food environment in recreational facilities (adapted from [301])

Alberta	*Guidelines*: Alberta Nutrition Guidelines for Children and Youth *Supports*: Resources at www.healthyalberta.ca, Health Promotion Facilitators, Communities ChooseWell program, Healthy U Food Checker
British Columbia	*Guidelines*: Nutrition Guidelines for Vending Machines in BC Public Buildings, Healthy Food and Beverage Sales in Recreation Facilities and Local Government Buildings *Supports*: Seed funding ($12,500), training, resources at www.stayactiveeathealthy.ca, Brand Name Food List, Dietitian Services (telephone service)
Manitoba	*Supports:* Making the Move to Healthy Choices Toolkit, resources at http://healthylife.cimnet.ca/cim/97C344_531T22135.dhtm, Registered Dietitians
New Brunswick	*Supports:* Healthy Eating in Recreation Facilities: It Just Makes Sense, $500 grants, resources at http://www2.gnb.ca/content/gnb/en/departments/dhic/wellness/content/healthy_foods.html
Newfoundland and Labrador	*Supports:* Eat Great and Participate Project, resources at http://www.livinghealthyschools.com/eatgreat.html
Nova Scotia	*Supports:* Resources at http://www.recreationns.ns.ca/resources/healthy-eating-in-recreational-settings/
Ontario	*Supports:* Eat Smart! Recreation Centre Toolkit, resources at http://www.eatsmartontario.ca/recreation_centre, Eat Smart! Choices Calculator
PEI	*Supports:* Resources at http://www.gopei.ca/index.php?number=1032444&lang=E, Registered Dietitians, Community Facilitators
Quebec	None
Saskatchewan	*Supports:* Support Healthy Eating at Work and Play – A resource guide for creating food policies at your worksite or recreation facility

1.7 Figures

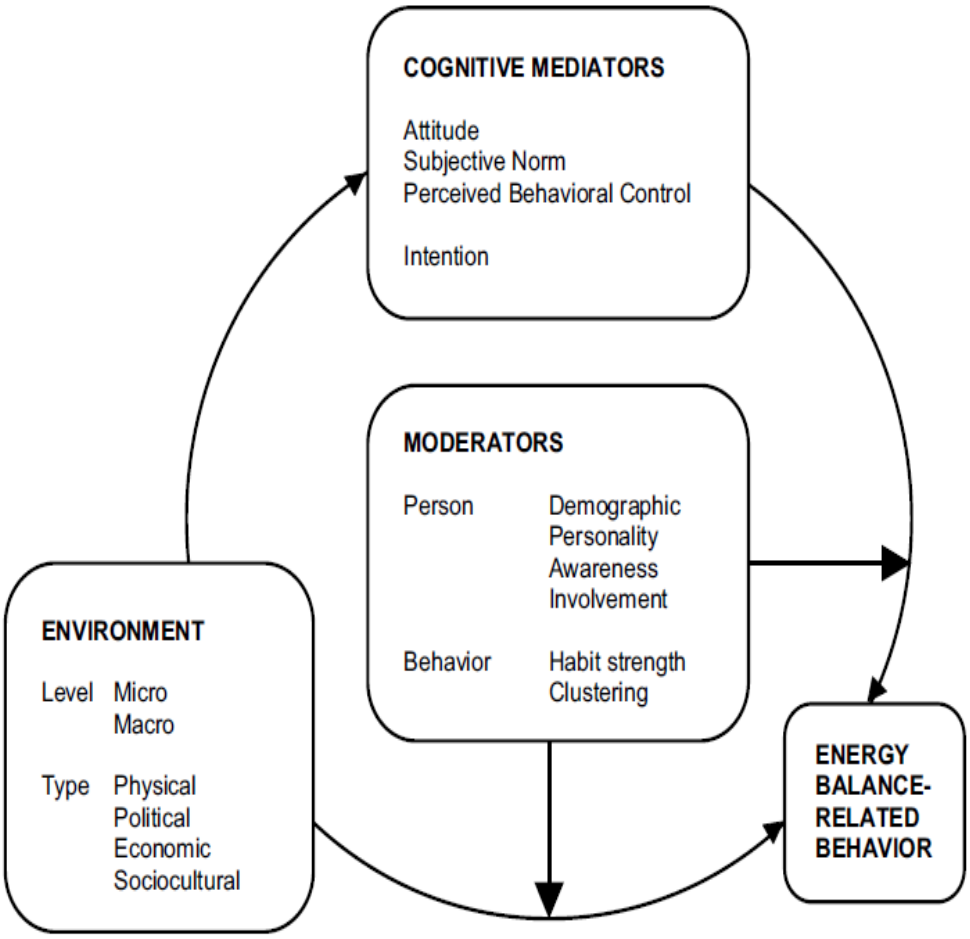

Figure 1.1 Environmental Research framework for weight Gain prevention (EnRG) Reproduced with permission. Source: Kremers et al [13].

Figure 1.2 Nuffield ladder of interventions
Reproduced with permission. Source: Nuffield Council on Bioethics [127].

> "The range of options available to government and policy makers can be thought of as a ladder of interventions, with progressive steps from individual freedom and responsibility towards state intervention as one moves up the ladder. In considering which 'rung' is appropriate for a particular public health goal, the benefits to individuals and society should be weighed against the erosion of individual freedom. Economic costs and benefits would need be taken into account alongside health and societal benefits. The ladder of possible policy action is as follows:"

Eliminate choice: Regulate in such a way as to entirely eliminate choice, for example through compulsory isolation of patients with infectious diseases.

Restrict choice: Restrict the options available to people with the aim of protecting them, for example removing unhealthy ingredients from foods, or unhealthy foods from shops or restaurants.

Guide choice through disincentives: Fiscal and other disincentives can be put in place to influence people not to pursue certain activities, for example through taxes on cigarettes, or by discouraging the use of cars in inner cities through charging schemes or limitations of parking spaces.

Guide choices through incentives: Regulations can be offered that guide choices by fiscal and other incentives, for example offering tax-breaks for the purchase of bicycles that are used as a means of travelling to work.

Guide choices through changing the default policy: For example, in a restaurant, instead of providing chips as a standard side dish (with healthier options available), menus could be changed to provide a more healthy option as standard (with chips as an option available).

Enable choice: Enable individuals to change their behaviors, for example by offering participation in an NHS 'stop smoking' programme, building cycle lanes, or providing free fruit in schools.

Provide information: Inform and educate the public, for example as part of campaigns to encourage people to walk more or eat 5 portions of fruit and vegetables per day.

Do nothing or simply monitor the current situation

1.8 References

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CHAPTER 2: Purpose and objectives

2.1 Purpose

The overarching purpose of this thesis is to investigate how factors within the political environment influence the food environment in recreational sports settings, and specifically, to investigate adoption and implementation of voluntary, government-issued nutrition guidelines (The Alberta Nutrition Guidelines for Children and Youth) in recreational facilities. It begins by examining the level of awareness, adoption and implementation of the ANGCY among Alberta's recreational facilities, proceeds to investigate the factors that influenced their uptake, and concludes by applying this knowledge to test practical strategies to support their ongoing use. Findings from this series of studies can be operationalized to accelerate uptake of the ANGCY in Alberta's recreational facilities.

2.2 Theoretical approach and overview

I adopted an ecological approach to this research, investigating how factors at all levels, and particularly within the political sphere, influenced the food environment in community recreational sports settings, and how these food environments in turn influenced the food purchasing decisions of patrons. Factors influencing adoption and implementation of nutrition guidelines were examined through a diffusion lens, while a dual process model of food-related decision making informed interventions within recreational sports food environments to improve patrons' food selections.

My first study (Chapter 3) was intended to set the stage by demonstrating the nature and extent of *the problem*. Study 2 (Chapters 4-8) was *conceptual* in nature, and explored the factors that influenced adoption and implementation of the ANGCY in 3 recreational facilities. These findings were *applied* in Study 3 (Chapters 9-10) through successive environmental interventions designed to support ongoing use of the ANGCY. A discussion of these 3 studies and the conclusions that followed from them is presented in Chapter 11.

2.3 Objectives

1) Rationale: The Government of Alberta released the ANGCY in 2008 as a resource to assist recreational facilities to improve their food environments. At the time of their release very little was known regarding the efficacy of voluntary guidelines in improving food environments in recreational facilities, as there was only 1 published study on this subject.

   Objectives of Study 1: The specific objectives of Study 1 were: 1) To describe the organizational priority for healthy eating, 2) To assess awareness of, adoption and implementation of the ANGCY, and 3) To describe the barriers to adopting and implementing the ANGCY in recreational facilities [1]. These objectives were accomplished through a provincial survey developed on the basis of Diffusion of Innovations theory.

2) Rationale: Findings from my first study showed that one-half of recreational facilities surveyed were aware of the ANGCY, and only 6% had implemented

them [1]. These results demonstrated that there were important barriers to using nutrition guidelines in recreational sports settings.

Objectives of Study 2: To investigate: 1) The nature of the food environment within 3 cases: an adopter, a semi-adopter and a non-adopter of the ANGCY; and 2) The factors that influenced adoption and implementation of the ANGCY within these recreational facilities [2, 3]. Diffusion of Innovations theory and case study methodology provided a basis to examine the multi-level influences on ANGCY adoption and implementation, considering the perspectives of recreational facility managers as well as managers from the food industry.

3) Rationale: Having established that few facilities were using the ANGCY, and with an understanding of the reasons underlying their low uptake, I planned an intervention to stimulate adoption and implementation of the ANGCY among a small group of recreational facilities. However, as described in a commentary in Chapter 8, managers were reluctant to participate in such a study, primarily because they did not believe selling healthier foods would be profitable [4]. These results were consistent with results from my previous studies, and underlined the importance of investigating strategies managers could use to increase sales of healthier items in recreational sports contexts.

   Objectives of Study 3: To assess the comparative and additive efficacy of 2 nudges and an economic incentive in supporting healthy food purchases by patrons in a recreational sports setting, and the impact of increasing the availability of healthy foods on sales of healthy items. Consistent with a dual process model of food-related decision making, nudges and increased availability of healthy items targeted direct environmental influences on dietary behaviors, while the economic incentive was applied to support a more thoughtful introspection on food selection.

2.4 References

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CHAPTER 3: Improving children's nutrition environments: A survey of adoption and implementation of nutrition guidelines in recreational facilities

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3.1 Introduction

It is widely recognized that the childhood obesity epidemic is primarily driven by unhealthy environments that promote consumption of energy-rich, nutrient-poor foods, and that discourage physical activity [1]. The food or nutrition environment refers to the context in which consumers purchase food, including the availability, cost, quality and promotion of healthy and unhealthy food choices [2]. The current food environment has been described as unhealthy and even obesogenic [3] because energy-dense and nutrient-poor foods are readily available, inexpensive, convenient, and heavily promoted. A predominance of unhealthy food environments has contributed to a high prevalence of dietary behaviors that increase the risk of obesity among children [3]. School-based studies, by contrast, have shown that healthy food environments foster good dietary behaviors [4-7] and appropriate body weights among children [5, 7] and as such, there is significant momentum across North America to improve school nutrition environments. Many, however, overestimate time spent in school, which in reality accounts for 20% of children's waking hours over the course of a year [8]. That this figure leaves 80% of time unaccounted for suggests a need to focus on obesity prevention in other settings [8]. The current focus on school-based initiatives ignores the broader context of unhealthy food environments [9] where less advantaged children, in particular, continue to be exposed to conditions that promote unhealthy dietary behaviors [10, 11]. A predominance of healthy food environments throughout communities will help to reinforce healthy eating behaviors (i.e. eating patterns consistent with recommendations in *Eating Well with Canada's Food Guide*) learned in school, ensure that intake of less healthful foods (i.e. foods with a high calorie, fat, sugar and/or sodium content, and a low micronutrient content) is not displaced from school to community food environments, and maintain and accrue further health benefits.

Although the mandate of recreational facilities is to enhance well-being, many offer foods inconsistent with recommendations for healthy eating [12-14]. To this end, municipalities are being encouraged to improve the nutrition environment within recreational facilities [15-19], and some mandated policies now exist [20, 21]. The Canadian province of Alberta has included voluntary nutrition guidelines for recreational facilities in the Alberta Nutrition Guidelines for Children and Youth (ANGCY). Released in June, 2008, the ANGCY are intended to promote child health in Alberta by equipping facilities and organizations with the tools they need to ensure children and youth have access to healthy food choices within a variety of settings, including schools, childcare and recreational facilities [17].

There are very few published studies of recreational facility food environments [12-14, 22-24]. Additional data would be timely and relevant, as several jurisdictions have recently initiated action to improve recreational facility food environments [17, 20-23, 25, 26]. The ANGCY represent a novel public health intervention with relevance for health policy in many nations. Therefore, we sought to investigate whether, and to what extent recreational facilities in Alberta were aware of, and had adopted and implemented the ANGCY, and the barriers to their adoption and implementation. We define awareness as having knowledge of the ANGCY, adoption as a one-time mental decision to follow the ANGCY, whereas implementation refers to multiple acts that must be repeated over time to put the decision into practice [27]. The specific objectives of this study were three-fold: 1) To describe the organizational priority for healthy eating, 2) To assess awareness of, adoption and implementation of the ANGCY, and 3) To describe barriers to adopting and implementing the ANGCY in recreational facilities.

3.2 Methods

3.2.1 Theoretical framework

Greenhalgh's multi-tiered model of diffusion of complex innovations within health service organizations (Table 3.1) and Prochaska and Velicer's transtheoretical model of change [28] constituted the theoretical framework for the study, and were used as a basis to structure data generating, analysis and interpretation [29]. Developed on the basis of an extensive meta-narrative review drawing on literature from 13 research traditions, Greenhalgh's framework identifies 9 key domains in which factors influencing diffusion are found. These domains encompass many aspects of Rogers' Diffusion of Innovations theory, while excluding those that have little empirical support [29]. Innovations in public health are increasingly comprised of complex, multi-component interventions and policies, where the unit of adoption is a group or organization [30], and therefore adoption and implementation of nutrition guidelines within recreational facilities was viewed as an appropriate context in which to apply Greenhalgh's model.

Stage of change is the central organizing construct of the transtheoretical model of change, which describes behavior change as a progression through a series of 5 stages [28, 31]. During the first 2 stages of pre-contemplation and contemplation there is a movement from not intending to take action to change to considering it. In the preparation stage, action is intended in the very near future. Those in the action stage have made change less than 6 months ago, while those in the maintenance stage have made change more than 6 months ago and are working to sustain it. Although originally developed to describe the behavior of individuals, the model has been applied to the field of organizational change on the basis that change in individual organizational member's behavior is the core of organizational change [31]. The theory can be readily integrated with diffusion theory as early adopters are more likely to be in later stages of change and was therefore used within the current study to determine whether, and to what extent recreational facilities had adopted and implemented the ANGCY.

3.2.2 Data collection

A cross-sectional telephone survey was conducted from June-December, 2009 with managers of publicly funded recreational facilities in the province of Alberta, Canada. This timing was important to capture an early perspective of adoption and

implementation of the ANGCY (approximately 1 year following their release). Letters were sent to a random selection of 408 of the approximately 1275 publicly funded recreational facilities in Alberta informing them about the study and inviting their participation. Facilities were eligible if they provided food through vending machines and/or concession-based food service. Interviewers called each facility and asked to speak with the facility director or manager, as they were likely to have made decisions pertaining to adoption and implementation of the ANGCY and would be better able to respond from an organizational perspective. When facility managers were unavailable, another manager who could provide this perspective was interviewed. A maximum of 3 attempts were made to contact a representative from each facility within the study time frame. The same 3 individuals conducted all of the telephone interviews. Interviewers were trained together and adhered to a standardized, structured interview protocol. Following completion of 5 interviews, interviewers met as a group to review the survey protocol and to discuss issues of concern.

The questionnaire was designed to be completed in less than 10 minutes and included 10 closed and 7 open ended questions to assess the organizational priority for healthy eating, awareness of, adoption, and implementation of the ANGCY using a diffusion lens (Table 3.2) [27, 29]. The first section was oriented around the hypothesis that facilities that placed a greater priority on healthy eating, as indicated by the presence of nutrition policies and initiatives to improve the nutrition environment, would be more likely to adopt the ANGCY (diffusion domain: attributes of the innovation). The next question was a filtering question and asked whether the respondent had heard of the ANGCY. The survey was stopped at this point if they had not. Subsequent questions focused on the involvement of a champion and how participants first learned of the ANGCY (diffusion domain: communication and influence). Diffusion theory describes adoption and implementation as staged processes, and therefore we sought to characterize the stage of organizational change by asking whether respondents had made ANGCY-motivated changes, and to describe their intent-to-use the ANGCY in terms of the stages of change construct [28]. Facilities in stages 3-5 (preparation, action and maintenance) were classified as adopters, while those in stages 3-5 who had made ANGCY motivated change were deemed to have implemented the ANGCY. Most of these closed ended questions requested respondents to choose among 3 options: yes, no, or unsure, and were phrased using language from the Alberta Heart Health Organizational Capacity Survey [32]. Open ended questions were intended to elicit participant's free-flowing ideas regarding factors that influenced their adoption and/or implementation of the ANGCY, and to obtain additional details regarding their responses to closed ended questions, and were therefore not theory-based. In some cases, responses to filter questions determined whether subsequent contingency questions would be asked, thereby providing a purposeful sample for several questions.

Content validity (appropriateness of constructs, language, length, clarity, organization) was established based on expert review by 2 scientists who were involved in the development of the ANGCY and by 4 experts in public health nutrition, childhood obesity, psychometrics and the recreational facility environment. Upon their recommendation, small changes were made to rephrase some questions and to the order in which questions were asked. The survey was reviewed and approved for use by

the Human Research Ethics Board at the University of Alberta and respondents provided verbal consent to participate.

3.2.3 Data analysis

Descriptive analyses were conducted to summarize all quantitative variables. Chi-squared tests examined the relationship between independent (whether someone was in charge of food service, rural/urban location, the priority of healthy eating, change in the priority of healthy eating in the past year, existence of nutrition policies, and the presence of a champion of the ANGCY) and dependent variables (awareness, adoption, and implementation). Responses of unsure were classified as missing. Analyses were performed using Stata (version 11; StataCorp LP, College Station, Texas). Results were considered significant at $p < 0.05$.

Greenhalgh's model provided the basis for development of a coding and categorizing scheme, and operational definitions for the codes and categories. The final scheme was inspected by an expert in health promotion and nutrition for congruence with the elements of the theoretical framework. A single investigator (DLO) used principles of directed content analysis [33] to analyse responses to open ended questions according to the theoretically-derived coding and categorizing scheme. Categories were not further integrated into themes, as this level of abstraction was not consistent with the goals of the study.

3.3 Results

3.3.1 Participation

Of the 408 facilities contacted for participation, 44 were deemed ineligible because they did not serve food or beverages. Of the remaining 364 facilities, 18 declined to participate for the following reasons; 5 declined because there was no one knowledgeable about food service available to answer the survey, 4 declined because they were not interested in completing a survey, 3 declined because they were undergoing renovations, and 6 did not provide a reason for not wanting to participate. In total, 151 facilities were reached by phone, met the inclusion criteria, and agreed to participate, representing a response rate of 41%. Twelve percent of the approximately 1275 publicly funded recreational facilities in Alberta participated in the telephone survey, however provincial officials and the Alberta Parks and Recreation Association estimate that only approximately 1020 recreational facilities in the province serve food (i.e. 80% of all publicly funded recreational facilities), therefore the true participation rate may have been closer to 15%.

3.3.2 Characteristics of the study sample

Seventy five percent of surveys were completed by individuals employed at the managerial-level within each recreational facility, whereas 18% were completed by individuals working at a managerial-level or higher (eg. councillor or mayor) within the community who were knowledgeable about the food service within their local recreational facility. Notably, 39% of facilities had an individual who was responsible for food service within the organization (Figure 3.1). Relatively balanced representation of rural (39%) and urban (61%) facilities was achieved. To simplify reporting of results,

participants are referred to as respondents or managers, although a small proportion (7%) were not managers.

3.3.3 Knowledge of the ANGCY

One half of managers in the study sample had heard of the ANGCY (Figure 3.2). None of the quantitative independent variables were associated with awareness of the ANGCY. The factors that contributed to knowledge of the ANGCY were found within the communication and influence domain of Greenhalgh's framework [29]. Processes of diffusion (in which spread of the ANGCY is unplanned and informal) were mediated by word of mouth (via children and adults), media and independent information seeking. Active dissemination (in which the ANGCY are spread via formal, planned strategies) occurred through formal educational events, receiving the ANGCY in the mail, emails, information provided in the workplace and via the provincial health board. The most common way that respondents who answered this question and were aware of the ANGCY (n=66) found out about them was through the recreational facility in which they worked (n=18), receiving the ANGCY binder in the mail (n=11), and through word of mouth from both children and adults (n=9). Most managers had only a limited knowledge of the content of the ANGCY.

3.3.4 Priority of, and action to support healthy eating

Healthy eating was a low priority for 32% of recreational facilities, a medium priority for 50%, and a high priority for 13% (5% unsure). For most, this priority had stayed the same (50%) or had increased (44%) over the past year. This priority translated to action for 51% of facilities where specific steps had been taken in the past year to improve the nutritional quality of foods offered (i.e. foods high in essential nutrients) (Figure 3.1). A small fraction of these changes (11%) were motivated by the ANGCY (Figure 3.1).

3.3.5 Nutrition policies

Nineteen percent of managers indicated that they had nutrition policies within their recreational facilities (Figure 3.1). These policies are summarized in Table 3.3. It is not clear how many policies each facility had, as managers were asked to provide examples of policies and not complete lists.

3.3.6 ANGCY adoption and implementation

Fourteen percent of facilities were classified as adopters (Figures 3.2 and 3.3). Facilities were more likely to adopt the ANGCY if some in their facility was actively promoting the guidelines (indicating the presence of a 'champion') ($p = 0.003$), and if the priority for healthy eating had increased in the past year ($p = 0.01$) (Table 3.4). There was also a trend for facilities to be more likely to adopt the ANGCY if they had nutrition policies ($p = 0.08$).

Six percent of facilities were deemed to have implemented the ANGCY (Figures 3.2 and 3.3). Facilities were more likely to have implemented the ANGCY if they had nutrition policies ($p = 0.03$) and if someone in their facility was actively promoting the guidelines (indicating the presence of a 'champion') ($p = 0.04$) (Table 3.4). Conversely, facilities were less likely to implement the ANGCY if the priority for healthy eating was medium to high ($p = 0.04$).

3.3.7 Barriers to adopting the ANGCY

Barriers to adopting the ANGCY corresponded with domains of Greenhalgh's framework related to the attributes of the innovation and the inner (organizational) context (Table 3.1) [29]. It is likely that barriers also existed within other domains of the framework, however the format of the interview (i.e. brief telephone survey) was more suited to uncovering more immediately evident micro and meso-level barriers encountered on a daily basis, than more distal macro-level barriers that may have existed within other domains of the framework.

1) *Attributes of the ANGCY*

Relative advantage and risk. Managers felt very strongly that adopting the ANGCY would put them at an economic disadvantage and decrease profit. Respondents framed their responses in 2 distinct ways. One group spoke of the higher costs associated with supplying healthy foods, stating that it is "too expensive... to serve healthy food". The other group framed their economic concerns in terms of the demand side of the financial equation, and felt that "the products that are not healthy sell better".

Compatibility. Perceived incompatibility of the ANGCY with organizational mandates was an important barrier to adoption. Managers correctly perceived that the intent of the ANGCY was to improve children's dietary behaviors, whereas they described their own operations as "driven by revenue" and as "more concerned about pool safety [than about using the ANGCY]". Some resented the attempted imposition of a food-related mandate, believing that "parents should not be buying these [unhealthy foods]" and that "it [was] not up to [them] to be the food police". For others, food service was not even "on the radar". Their food service was contracted out and therefore they felt they "[did not] have control over food in [their] facilities", and that "[adoption of the ANGCY] has to be up to the providers". Therefore, to the extent that the ANGCY were perceived to promote goals that did not coincide with their own, managers regarded the ANGCY as incompatible with food service in recreational facilities.

Several managers expressed reluctance to implement the ANGCY because they either did not serve many children or served more than the child/youth demographic. Thus, these managers perceived the ANGCY to be incompatible with their customer mix.

C*omplexity.* Managers perceived that the ANGCY would increase the complexity of their operations because they believed healthier foods required additional preparation time, were less convenient and had shorter shelf lives than their traditional product mixes. This complexity presented a barrier to ANGCY adoption.

2) *The inner (organizational) context: Organizational antecedents and readiness for the ANGCY*

Technical capacity and dedicated time/resources. Resource limitations were perceived as problematic with respect to adopting the ANGCY. Several managers indicated that they "just have vending machines, so it is difficult to offer healthy choices", while others said that "time and staffing issues" were influential.

Absorptive capacity for new knowledge, managerial attitude toward change, tension for change. Cultural norms and expectations were highly influential with respect to the intent-to-use the ANGCY. Managers believed that "people love fries and burgers and that's what they want in a hockey rink", and this belief guided the provision of food. They also found it "really hard to get people to want to change", as staff and customers alike seemed content with the status quo. Thus, some managers did not use the ANGCY because they wanted to maintain organizational stability, and avoid the additional effort required to find, interpret and integrate new knowledge into the organization. They did not perceive having made a deliberate decision to serve unhealthy foods. Rather, cultural norms had become so entrenched that managers did not perceive that their food service practices were incompatible with wellness and were contributing to broader social ills. In short, they did not experience any tension for change.

3) No barriers

Notably, some managers who had not adopted the ANGCY could not identify any barriers preventing them from doing so.

3.3.8 Barriers to implementing the ANGCY

Barriers to implementation corresponded with elements of Greenhalgh's framework related to the attributes of the innovation and the implementation process (Table 3.1) [29]. Although common barriers to adoption and implementation existed (eg. profitability), the way in which participants discussed these barriers differed according to whether they were asked to describe barriers to adoption versus those affecting implementation.

1) Attributes of the ANGCY

Compatibility. Perceived incompatibility of the ANGCY with customer expectations and profit-making emerged as a unifying theme that integrated findings from all aspects of the framework. As summarized by one manager: "Unhealthy foods are big sellers. Fried foods like French fries are cheap to buy. People have a perception of what foods they want. If people are watching a hockey game they want burgers and fries, not a salad. The operator needs to provide foods that people want. If everyone wanted salad you would make salad".

Relative advantage, complexity, task issues. To the extent that managers perceived that "healthier food [was] not as profitable", was less convenient, less available from wholesalers, spoiled more quickly and required more effort to prepare than unhealthy foods, they regarded their new ANGCY-inspired product mix as inferior to their previous one. These qualities of healthy items also made them more complex to work with, and less compatible with the performance of tasks than unhealthier options, further eroding managers' desire to provide healthier options.

Observability. Regardless of how effective the ANGCY prove to be, their contribution to improved health outcomes are primarily of a long-term nature, and recreational facility managers are unlikely to have the opportunity to observe these benefits. Although shorter-term benefits might be evident in the form of increased sales of healthy items, this was not yet the case. Instead, managers became discouraged because "healthy

food was not selling", and children were instead purchasing unhealthy items from nearby convenience stores, thereby eroding their own sales.

2) The implementation process

Feedback. Despite managers' best efforts to implement the ANGCY and incent purchase of healthy items through pricing strategies, children continued to purchase unhealthy items. These purchasing patterns acted as a form of negative feedback that suggested to managers their efforts were futile: "The other thing we have noticed is, since there is a discretionary income for kids nowadays, they will pay $8 for a poutine even if the healthier options are competitively priced. Unless we go to extreme prices that's what's going to happen".

3) No barriers

Notably, some managers who had implemented the ANGCY could not identify any barriers to implementing them.

3.4 Discussion

These findings demonstrate that awareness (50%), adoption (14%), and implementation (6%) of the ANGCY were low among this sample of recreational facilities approximately 1 year following their release. Similarly, evidence from the Treatment Improvement Protocols (TIPs) evaluation project suggests that awareness of government-developed best practice guidelines for substance abuse treatment spread slowly, as only 45% of professionals working in the substance abuse field were aware of the TIPs approximately 7 years following their release [34]. Diffusion of tobacco control policies was also a lengthy process [35]. Initiatives to address recreational facility food environments are very recent [22, 23], change will require support and thus it may not happen quickly [13, 14]. Awareness of the ANGCY on the part of recreational facilities may actually be high relative to the short period of time that has elapsed since their release, and considering the fact that few resources were directed toward dissemination.

Although just over half of facilities had made changes to improve the nutritional quality of foods offered, only a small proportion (11%) of these changes were motivated by the ANGCY. This survey was not intended to assess the extent or fidelity of implementation of the ANGCY, however open-ended responses suggest that implementation was incomplete. Notably, adoption and implementation were more likely among facilities with an 'ANGCY champion', a finding common in many other contexts [36, 37]. Facilities with nutrition policies appeared to be more likely to adopt and implement the ANGCY, although it is not clear whether these policies were precipitated by, or existed prior to ANGCY adoption. These findings demonstrate that creating nutrition guidelines does not in itself constitute a sufficient stimulus for widespread change within the food environment of recreational facilities in the first year following their release. Similarly, awareness [38] and even adoption [39] of practice guidelines in other settings also did not guarantee their implementation. An important strength of the current study is its use of a mixed questionnaire which enabled further exploration of the distinct barriers to adoption and implementation of nutrition guidelines in this context.

It is unclear why facilities were less likely to implement the ANGCY if the priority for healthy eating was medium to high. Among the 9 facilities deemed to have implemented the ANGCY, 6 indicated that healthy eating was a low priority. As was the case for adoption, it is possible that the change in priority is more relevant to implementation than the absolute priority, as the priority for healthy eating had increased among 6 of the 9 implementers, and was unchanged in the other 3. Furthermore, the survey was not designed to assess the extent of change made. Therefore, although these facilities had made ANGCY-motivated change, it is possible that these changes were minor, consistent with a low priority for healthy eating.

An extensive body of research supports the notion that the key attributes of innovations, as perceived by potential adopters, account for a significant proportion of the variability in adoption rates [29]. Although other factors were also important, perceived negative characteristics of the ANGCY were consistently described as barriers to their adoption and implementation. These perceptions were strongly driven by the constructs of relative advantage and compatibility [27, 40], in which managers perceived that adopting and implementing the ANGCY would limit their profit-making ability. Given managers' limited knowledge of the ANGCY it is possible that some of these negative perceptions may be amenable to change through the provision of training and technical assistance [41] to enhance understanding and application of the ANGCY.

Food choices are primarily made on the basis of taste, cost and convenience, and to a lesser extent, health and variety [42, 43]. Individuals vary in the importance they ascribe to each of these dimensions [42, 43], however children are particularly vulnerable to external influences because they fail to take into account the future consequences of today's unhealthy dietary choices [44, 45]. In this study, the perceived higher costs of healthy foods emerged as a particularly salient barrier that limited the marketability, and hence the availability, of healthier options. This finding was not surprising, as one of the most powerful ways to modify food purchases is to change food pricing [46, 47]. Indeed, when healthier foods are substituted for less healthy foods at competitive prices in both cafeterias [48] and vending machines [49-51], children's purchases of healthier foods increases with no loss of revenue [52]. The threat of reduced profitability was also an important barrier to providing healthier food options in other studies of recreational facilities [13, 14, 22-24], however in spite of these fears, many recreational facilities intended to continue to offer healthier options [14, 22, 23]. This suggests that concerns related to profitability need not preclude adoption and implementation of the ANGCY.

Given that financial considerations figured prominently into the decision of managers not to adopt and implement the ANGCY, recreational facility managers could consider raising prices on less healthful foods to compensate for lowered prices of healthful options, and stipulate that food contractors do the same within negotiated contracts. This strategy may encourage substitution of healthy for unhealthy items while maintaining revenues [48, 53]. In addition, environmental changes that increase availability and promotion of lower fat foods lead to greater purchase of these items among adolescents, with no adverse effects on school revenues [54]. Thus, pricing and

environmental modifications analogous to those recommended in the ANGCY may act in a complementary manner to support purchase of healthy items by children without adversely affecting food service revenues. Success will, however, require a fundamental shift in the managerial role, from one in which managers simply respond to consumer demand, to one in which they endeavor to shape demand by actively manipulating food availability towards a healthier mix.

Findings from this study suggest that recreational facility managers may not recognize the contribution made by unhealthy community nutrition environments to childhood obesity. Instead, some managers held to a personal responsibility frame, holding parents responsible for what is a predictable response to toxic environmental conditions [55]. Strategies to improve problem recognition should therefore be enacted prior to proceeding further with ANGCY adoption and implementation [41].

The dissemination strategy adopted by the provincial government for recreational facilities included mailing ANGCY resource binders to municipalities, presentations by government staff at educational events and posting the guidelines on the internet. Reliance on mailings and presentations has proven ineffective in other dissemination studies [39, 56-58], and appears to have had limited efficacy in this context as well. Conversely, comprehensive, resourced dissemination guided by theoretical constructs similar to those underlying the current study has been successful [39]. Awareness and uptake of the ANGCY might be improved in recreational facilities by adapting successful dissemination strategies used in other settings. It is also possible that the time frame used in this study may have been too short to see widespread awareness, adoption and implementation of the ANGCY.

It is ironic that the very places where children go to be active may be perpetuating the problem of obesity by providing little access to healthy food options [12-14]. This study is one of few published accounts of adoption and implementation of nutrition guidelines in recreational facilities [14, 22, 23, 59]. If fully adopted and implemented, the ANGCY have the potential to make a significant and sustained contribution to changing recreational facility food environments, however 1 year following their release, awareness, adoption and implementation of the ANGCY remained low. Findings from this study suggest that further raising the priority of nutrition, and motivating action to address the nutrition environment within recreational facilities under a voluntary approach will be a significant, resource-intensive challenge given manager's fears of reduced profitability. In contrast, a policy-based approach has significant potential to improve the nutrition environment within recreational facilities in a cost-effective and timely manner. Future studies are needed to investigate the efficacy of interventions to stimulate increased uptake of nutrition guidelines in this context, and to determine their impact on food service revenues. Recreational facilities serve large numbers of children and youth, and therefore implementation of nutrition guidelines in this setting can help to improve children's dietary behaviors at a population-level.

3.4.1 Limitations

It is not clear to what extent these observations reflect the entire population of publicly funded recreational facilities in Alberta, however a larger sample size was not attainable

within the timelines used to define early adoption. Future studies should anticipate challenges related to contacting and recruiting rural facilities, which may rely on part-time, volunteer staff. Alberta has 1275 publicly funded recreational facilities, however the number of facilities that serve food is unknown. Provincial officials and the Alberta Parks and Recreation Association estimate that approximately 80% of the 1275 serve food, suggesting that we sampled 15% of the relevant population with a response rate of 41%. In addition, we used random sampling to provide protection against sampling bias [60]. We considered whether the inferences made would differ if our estimates were off by a margin of error of ± 7.5% with a 95% confidence interval (based on a population of 1275 recreational facilities). Under this scenario, 95% of the time the true proportion of facilities who have heard of the ANGCY would range from a low of 42% to a high of 58%. Similarly, the true proportion of adopters might range from 6% to a high of 22%, with implementers constituting between 0% and 14% of facilities. Thus, even under the worst case scenario, study findings of low levels of awareness, adoption and implementation of the ANGCY remain robust.

Given the limited nature of the qualitative data collected in this study, we were unable to fully assess the fit of Greenhalgh's framework in this context. The framework did provide a good fit for the data, however we noted several areas of overlap among subcategories, suggesting there may be areas in which the model can be rendered more concise for application in this setting. Findings from this study will be used to select a purposeful sample for a subsequent, in-depth exploration of adoption and implementation of the ANGCY, thereby enabling a thorough exploration of the utility of Greenhalgh's model in this context.

3.5 Tables

Table 3.1 Major components of Greenhalgh et al's [29] **theoretical framework**

	Framework components	Description
	Attributes of the innovation	Perceived attributes of the innovation explain much of the variance in adoption rates.
Elements of the user system	Organizational antecedents for innovation	General features of the organization that make it more or less innovative.
	Organizational readiness for innovation	Factors that influence the organization's readiness and/or willingness to adopt a specific innovation.
	Adopter characteristics	Characteristics of adopters and their interactions with the innovation in the adoption process.
	Implementation process	Specific steps taken to put the adoption decision into practice.
	Processes of assimilation	Assimilation is a lengthy process, encompassing adoption and implementation. It is not linear, organizations may move back and forth between initiation, development and implementation of the innovation.
	Communication and influence Diffusion and dissemination	The means of spreading the innovation lie on a continuum from passive diffusion to active dissemination.
	Outer context	External influences on the organization's decision to adopt an innovation and efforts to implement it.
	Linkage among components of the model	Connections that facilitate movement of the innovation from the resource system to the user system.

Table 3.2 Theoretically-informed questionnaire

1. How many employees are there in your organization?

2. How many youth does your organization provide for?

3. Is there a person in charge of food service within your organization: Yes; No.

4. Within your organization would you say healthy eating is a: Low priority; Medium priority; High priority; Not sure.

5. Compared to one year ago, would you say the priority given to healthy eating within your organizations has: Decreased; Stayed the same; Increased; Not sure.

6. Are there any current nutrition policies within your organization: Yes; No.

   If yes, What nutrition policies currently exist within your organization?

7. Have you made any changes to improve the nutritional quality of the foods offered in your organization within the last year: Yes; No; Not sure.

   If yes, please describe these changes.

   Have you heard of the Alberta Nutrition Guidelines for Children and Youth: Yes; No. (If answered no, the survey is completed here)

   If you made changes to improve the nutritional quality of the foods offered in your organization, were they due to the Nutrition Guidelines for Children and Youth: Yes; No; Not sure; No changes.

8. How did you hear about the Alberta Nutrition Guidelines for Children and Youth?

   What do you know about the Alberta Nutrition Guidelines for Children and Youth?

9. Is there someone within your organization who is involved in promoting the Alberta Nutrition Guidelines for Children and Youth: Yes; No; Not sure.

   If yes, what is this individual's position in the organization: Board of Directors; Management; Service-Provider; Other (please specify); Don't know.

10. Which of the following best represents your facility's intent-to-use the Alberta Nutrition Guidelines for Children and Youth: We have not thought about it; We are thinking about it; We are in preparation (planning programs and/or taking some steps); We are currently promoting and using the guidelines and have started some programs (< 6 months time frame); We have been promoting and using the guidelines for more than 6 months and have ongoing programs.

If not using: What are the reasons for not using the guidelines (Are there any barriers)?

If using: How is your organization using the guidelines? Have you experienced any challenges or barriers to implementing the guidelines?

Table 3.3 Nutrition practices and policies described by a sample of managers of recreational facilities in Alberta

Changes to improve nutritional quality[a]	**Areas addressed by nutrition policies**[a]
Substitution of less healthy for more healthy items (eg. granola bars replace chocolate bars, baked chips replace fried chips, milk replaces soft drinks)	Availability of healthy options[b] (eg. minimum percentage of healthy options, removing unhealthy options, substitution of healthy for unhealthy options)
Addition of healthier items (eg. sandwiches, salads, fruit, milk added to menus)	Specific nutrients and food groups (eg. no trans fats, low sugar)
Removal of less healthy items (eg. removal of chocolate bars, chips, sugar sweetened beverages)	Aesthetics (eg. healthy foods attractively and prominently displayed)
Using healthier preparation methods (eg. baking instead of frying, healthier cooking oils)	Pricing (eg. healthy foods competitively priced)
Bringing in vendors perceived to offer healthier choices (eg. Pita Pit, Booster Juice)	Provision of information (eg. menu labelling, food rating systems)
	Portion size (eg. reduced portion size)
	Allergies and food safety (eg. no nuts, no food from home)

[a]Applicable to vending machines and/or concession-based food vendors.
[b]There was a wide range in the proportion of healthy to unhealthy items permitted.

Table 3.4 Characteristics of recreational facilities that adopted and implemented the Alberta Nutrition Guidelines for Children and Youth (n=151)

	Proportion of facilities that adopted the ANGCY	Proportion of facilities that implemented the ANGCY
Someone in charge of food service	17%	9%
Urban location	17%	9%
Medium to high priority of healthy eating	16%	4%[a]
Priority of healthy eating increased in the past year	22%[b]	10%
Have nutrition policies	24%	17%[c]
Presence of a 'champion'	67%[d]	44%[e]

[a]$p < 0.05$ relative to facilities that had a low priority for healthy eating (13%)
[b]$p = 0.01$ relative to facilities where the priority for healthy eating had not increased in the past year (8%)
[c]$p < 0.05$ relative to facilities that did not have nutrition policies (4%)
[d]$P < 0.01$ relative to facilities that did not have a 'champion' (23%)
[e]$p = 0.01$ relative to facilities that did not have a 'champion' (11%)

3.6 Figures

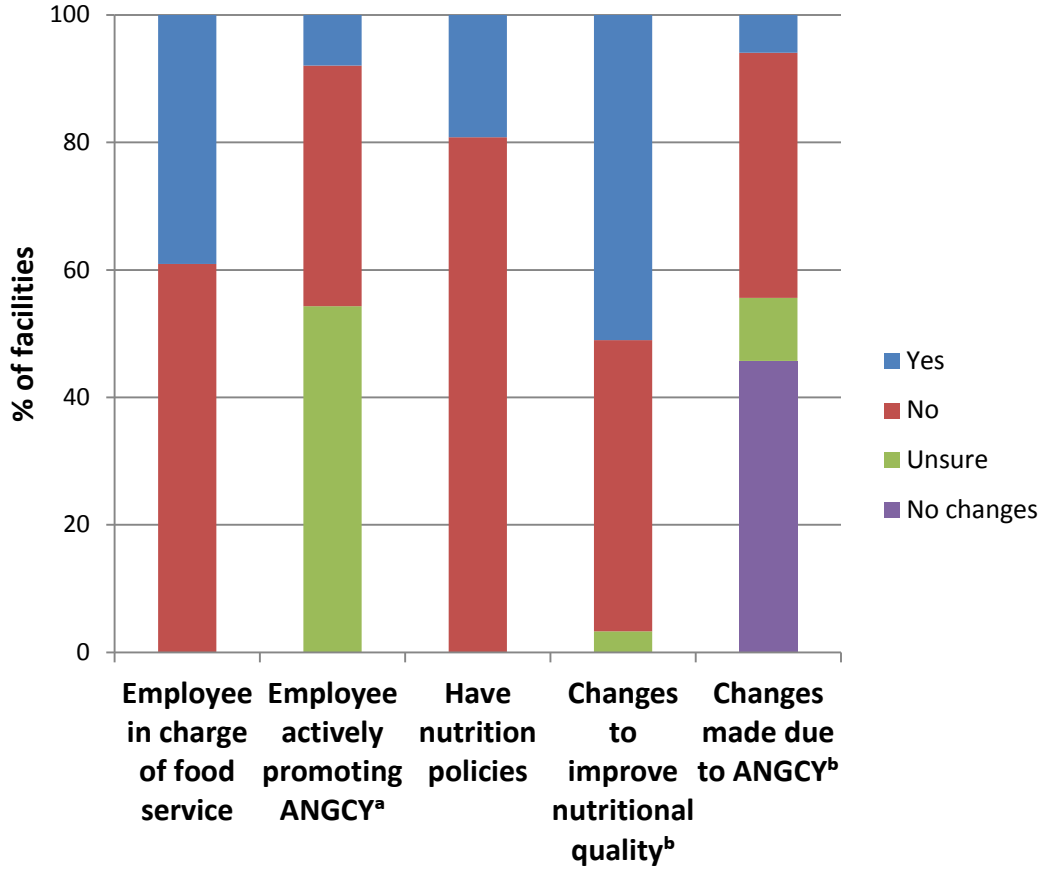

Figure 3.1 Nutrition policies and practices of a sample of recreational facilities in Alberta (n=151)

[a]This question was only asked of those who had heard of the ANGCY (n=76), and therefore the 75 facilities that had not heard of the ANGCY were classified as 'unsure'. The question was worded as: "Is there someone within your organization who is very involved in promoting the guidelines?" This individual was deemed an ANGCY 'champion', and may or may not have been promoting the ANGCY as part of their job-related duties.

[b]Refers to changes in the past year only.

ANGCY, Alberta Nutrition Guidelines for Children and Youth.

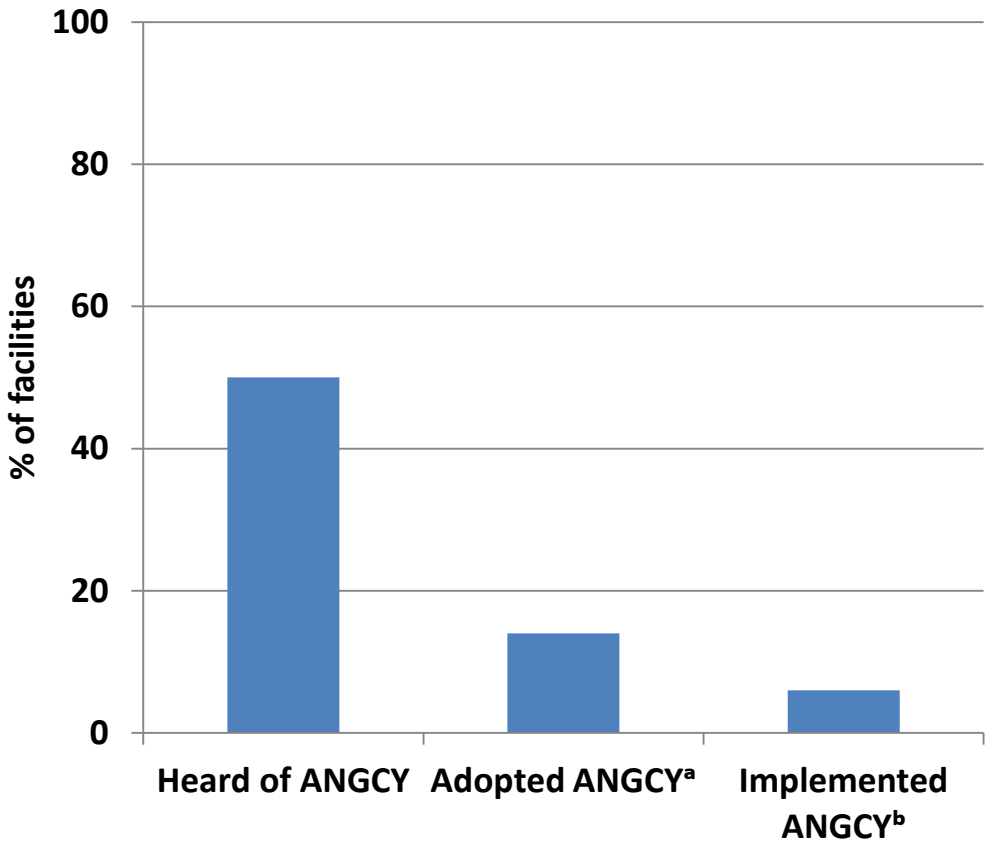

Figure 3.2 Proportion of recreational facilities that were aware of, and had adopted and implemented the ANGCY (n=151)

[a]Adoption is defined as facilities in stages 3-5 of the transtheoretical model (preparation, action, maintenance) [28].

[b]Implementation is defined as facilities in stages 3-5 of the transtheoretical model that had made ANGCY-motivated changes to improve nutritional quality.

ANGCY, Alberta Nutrition Guidelines for Children and Youth.

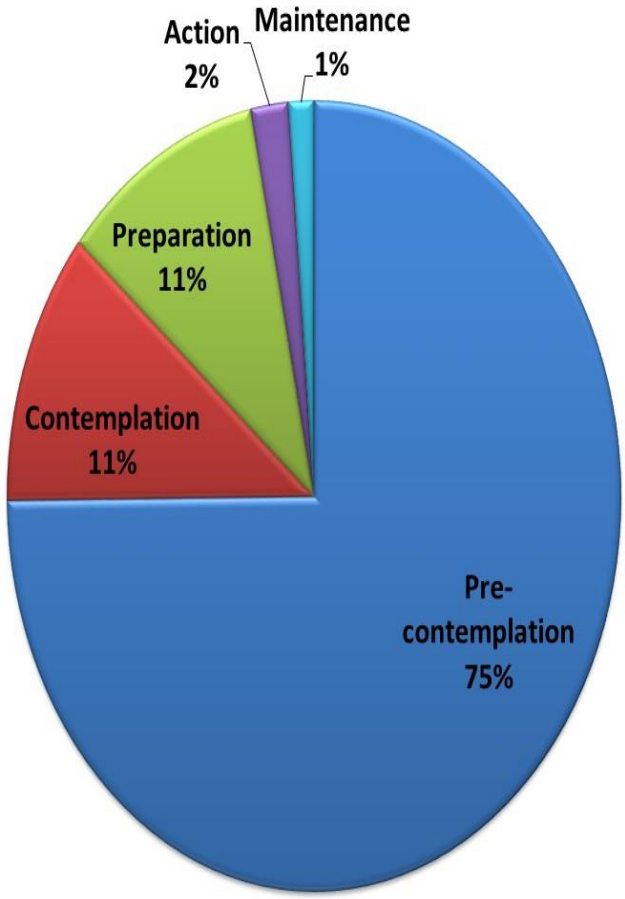

Figure 3.3 Organizational stage of change according to the transtheoretical model (n=151) [28, 31]
Stage 1: Pre-contemplation (have not thought about using the ANGCY); Stage 2: Contemplation (thinking about using the ANGCY); Stage 3: Preparation (planning programs and/or taking steps toward using the ANGCY); Stage 4: Action (currently promoting and using the ANGCY and have started some programs, < 6 mos); Stage 5: Maintenance (currently promoting and using the ANGCY and have started some programs, > 6 mos).
ANGCY, Alberta Nutrition Guidelines for Children and Youth.

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CHAPTER 4: Adoption and implementation of the Alberta Nutrition Guidelines for Children and Youth in a recreational facility: A mixed methods case study

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4.1 Introduction

The rise in obesity prevalence among children in past decades has increased interest in the role that unhealthy environments that promote consumption of energy-rich, nutrient-poor foods, and that discourage physical activity may have played in this rise [1]. While there is significant momentum in Canada to improve school nutrition environments, little attention has been paid to improving other food environments of relevance to children. Empirical data have recently confirmed that recreational facilities are one such environment that should be addressed, as they are a primary community health resource offering affordable opportunities for physical activity and recreation [2, 3]. Despite their health mandate, however, many offer foods inconsistent with recommendations for healthy eating [4-7], thereby exposing children to conditions that promote unhealthy dietary behaviors. As a result, some Canadian cities [8, 9] and provinces [7, 10-12] have initiated action to improve the food environment in recreational facilities.

In Alberta, the Alberta Nutrition Guidelines for Children and Youth (ANGCY) are intended to facilitate children's access to healthy food/beverage choices within schools, childcare and recreational facilities by providing recommendations on ways to improve these food environments, and through a food rating system that specifies the types of foods that should be offered [10]. The food rating system categorizes food and beverages into 3 categories of Choose Most Often (CMO), Choose Sometimes (CS) and Choose Least Often (CLO) by considering fat, protein, fibre, sugars, sodium and selected micronutrients [10]. Uptake of the ANGCY in recreational facilities has been limited compared to other settings, however, as only 6% of facilities had implemented the guidelines 1 year following their release [6]. Recreational facilities may require additional support to adopt and implement nutrition guidelines given that their food services are often delivered on a for-profit basis, use of recreational facilities is voluntary, and their nutrition policies necessarily affect food options available to adults as well as children.

4.1.1 Purpose

The purpose of this study was to investigate: 1) The nature of the food environment within a recreational facility that had adopted and implemented the ANGCY, and 2) The factors that influenced their adoption and implementation. Diffusion theory provided generalizing principles to explain adoption and implementation of the ANGCY within this context. Adoption is defined herein as a one-time mental decision to follow the ANGCY,

whereas implementation refers to multiple acts that must be repeated over time to put an adoption decision into practice [13].

4.2 Methods

4.2.1 Study design

This mixed methods case study used Greenhalgh's diffusion of innovations theory as a heuristic to structure data collection, analysis and interpretation, and to provide a basis for generalizing findings to new cases (Table 4.1) [14]. The study was approved by the Faculties of Physical Education and Recreation, Agricultural Life and Environmental Sciences and Native Studies Research Ethics Board at the University of Alberta. Informants provided written, informed consent prior to participating in this study. To protect the identity of participants, descriptions of the setting are of a general nature and do not include details that might lead to identification of the case.

4.2.2 Data generation

Data generation and analysis were concurrent to permit exploration of emerging themes and adjustment of data gathering instruments and procedures. The facility was chosen because it was the only facility known to have implemented the ANGCY more than 1 year prior to the current study, which took place in the summer of 2010. A previous investigation identified 1 year as the minimum time frame within which significant change could be expected in this setting [15].

4.2.2.1 Interviews

The theoretical framework [14] guided development of a brief semi-structured interview guide (Table 4.2). The guide was pilot tested with 2 recreational facility managers. The recreational facility manager participated in 2 in-person semi-structured interviews lasting 60 and 90 minutes, respectively. Corroborating evidence and a variety of perspectives was sought by interviewing 4 other purposefully selected managers for 45-90 minutes each, including the local manager and the district manager for the privately-operated concession, the manager responsible for the facility's privately-operated vending machines, and another facility manager within the municipality who had played a key role in adopting and implementing the ANGCY. Three of these interviews were conducted in-person, and one was conducted over the telephone. All interviews were recorded and transcribed verbatim.

4.2.2.2 Observations

Three formal 30 minute observation periods of the facility's foodservice were conducted by 2 independent observers during different days and times of day. Observers were guided by a theoretically-informed observation guide, supplemented by fieldnotes and 'grand and mini-tour' observations taken during and after the observation sessions [16, 17]. Observers recorded the salient features of the food environment and the activities and behaviors of staff and patrons within the environment. Observations recorded by both observers were transcribed and used in the analysis.

4.2.2.3 Document review

A review was conducted of general administrative documents related to the case including policies, food service contracts, and the recreation department's strategic

plans. Printed and online sources of municipal statistics were consulted to obtain contextual and organizational information.

4.2.2.4 Sales data

Detailed sales data were requested from food vendors.

4.2.2.5 Assessment of the food environment

The food environment was assessed using four complementary measures to provide a comprehensive assessment of its multiple dimensions.

Food and beverage availability

Foods and beverages within vending machines and the concession were recorded and classified according to ANGCY criteria [10]. Nutrition information was obtained from food vendors, company websites, directly from manufacturers, and where necessary from the Canadian Nutrient File and Food Processor SQL (ESHA Research Inc, Salem, OR).

Nutrition Environment Measures Survey in Restaurants (NEMS-R) assessment

The NEMS-R is a validated observational instrument that provides a comprehensive and quantitative assessment of factors that contribute to food selection in restaurants [18]. A trained researcher completed the NEMS-R in the facility.

Nutritional profile of vending machine items

Nutrition information for all items within vending machines was obtained from package labels, company websites or the manufacturer to determine the average nutritional profile of vending machine items [19].

ANGCY adoption and implementation scores

ANGCY adoption and implementation scores from 0 to 38 were assigned by 2 raters on the basis of direct observations, review of menus and policies, and information provided by managers. Each scoring system consists of up to 19 policies or environmental characteristics recommended in the ANGCY (for a list of ANGCY recommendations see Table 4.3), for which facilities received a 0, 1, or 2 according to whether the policy (adoption) or environmental characteristic (implementation) was present (1 = partially present, 2 = fully present) or absent (0), with a higher score indicating greater congruence with the ANGCY. Discrepancies between raters were resolved through discussion to arrive at a mutually agreed upon score. Qualitative observations were also recorded for each of the content items. Researchers and government officials involved in developing the ANGCY assessed the content validity of the scoring systems to ensure congruence with ANGCY recommendations. The scoring systems were pilot-tested in 1 facility by 2 raters for reliability and to clarify decision rules.

4.2.3 Data analysis

4.2.3.1 Qualitative interviews, observations and documents

Directed content analysis was used [20]. Using this approach, the theoretical framework guided development of an initial coding and categorizing scheme and operational definitions for the codes [20]. Another member of the research team

inspected the coding scheme to ensure congruence with the elements of the theoretical framework. A single investigator applied the scheme to all study data using techniques of memoing, constant comparison and questions. NVivo software (v.8, QSR International, Cambridge, MA) was used to organize the data.

4.2.3.2 Assessment of the food environment

Food and beverage availability

The number of CMO, CS and CLO items available was expressed as a percentage of the total distinct items available for sale, and as a percentage of the total items within each food category (main dish and side items, snacks and desserts, beverages).

Nutrition Environment Measures Survey in Restaurants (NEMS-R) assessment

The NEMS-R score (range -27 to +63) for the concession was determined according to the standardized protocols of Saelens et al [18].

Nutritional profile of vending machine items

Nutrients present within all items in food and beverage machines were added to derive a total for each type of machine, and an average was derived representing the average nutrient content of an item from each type of machine [19].

ANGCY adoption and implementation scores

The total ANGCY adoption and implementation scores were derived by summing the scores for individual content items. Scores were expressed as a percentage of the total possible score.

4.2.4 Data integration

Mixed methods were used for the purposes of triangulation and complementarity and thus the different methods remained independent during data collection and analysis [21]. Following analysis, the range of possible scores for quantitative measures were divided into quintiles and transformed into textual descriptions to facilitate description, where the top quintile (ie. 81-99%) corresponded to a rating of 'very high/healthy', followed by 'healthy/high', 'moderately healthy/high', 'limited' and 'very limited'. Quantitative and qualitative data were then integrated into a single case study data set and jointly interpreted to produce the case report.

4.3 Results

4.3.1 Local context and setting

The recreational facility was a newly built, large multiplex building including a soccer centre, pool, gymnastics area, fitness centre and studios, climbing wall, running track, field house, and an arena. Approximately half of its users were under the age of 18. Food service was provided by a concession that was part of a national chain popular for its fries, poutine and pizza. The vending machine company was a small local firm with a similarly unhealthy food base.

4.3.2 Adoption of the ANGCY

4.3.2.1 Adoption of the ANGCY via nutrition policy

Following the release of the ANGCY in June, 2008, the facility manager and a colleague used the ANGCY as the basis for developing a nutrition policy applicable to all recreational facilities within the municipality (Table 4.3). The policy was based in choice, in that it allowed healthy and unhealthy foods to be sold concurrently. The ANGCY policy score was 82% for this facility, indicating that the policy was very highly congruent with the ANGCY.

4.3.2.2 Factors influencing adoption of the ANGCY (ie. the innovation)

The facility manager first became aware of the ANGCY through participation in a stakeholder consultation on an early draft of the guidelines (communication and influence) and through dialogue with local School Boards (organizational readiness for the ANGCY). Later, the imminent expiry of the facility's food service contracts provided the principal adoption stimulus (organizational antecedents for the ANGCY), fuelled by the manager's strong personal convictions regarding the importance of healthy eating (adoption process). There were few barriers to adoption, however the perceived financial risk associated with offering healthier items was a consideration, as was the fact that there were no examples of successful adoption to emulate (attributes of the ANGCY). In addition, healthy eating in the recreational facility setting had little prominence within municipal discourse (outer context), as the school food environment was the primary focus.

4.3.3. Implementation of the ANGCY

4.3.3.1 Assessment of the food environment

Implementation of the ANGCY was assessed through evaluating the quality of the nutrition environment. The NEMS-R score suggested a healthy nutrition environment and ANGCY implementation scores were indicative of high implementation, with an overall score of 74% for the facility (Table 4.4, 4.5). The availability of healthy (CMO) options was, however, limited in the concession and beverage vending machines and very limited in food vending machines (Table 4.4, 4.5). These quantitative findings were broadly congruent with qualitative observations recorded by observers which indicated there were many positive features of the food environment, while noting that a majority of items remained energy dense and nutrient poor.

4.3.3.2 Sales data

Limited sales data provided by the concession showed that sales were lower following implementation of the ANGCY, and the vending machine company reported similar outcomes. Both attributed these losses to a combination of recessionary factors and the introduction of the ANGCY, contending that to comply with the ANGCY they had had to replace some highly saleable unhealthy items with less saleable, healthy items, and that healthy foods had lower profit margins, shorter expiry dates, and required more time to prepare and to source.

4.3.3.3 Implementation of the ANGCY via food service contracts

Responsibility for implementation of the ANGCY was devolved to food vendors through inclusion of selected nutrition standards from the nutrition policy document into

renewed food service contracts beginning January, 2009 (Table 4.3). This was regarded as the only feasible means of ANGCY implementation given the facility's resource constraints.

4.3.3.4 Factors influencing implementation of the ANGCY (Table 4.6)

1) Attributes of the ANGCY

Relative advantage: Managers perceived that proceeding further with implementation of the ANGCY would reduce profitability for food vendors such that they would no longer be able to financially support local organizations and activities, or infrastructure within the facility itself (e.g. scoreboards). Therefore, insofar as managers believed that selling healthy food was not profitable, they did not believe the ANGCY provided them with a relative advantage.

Complexity: The vending machine manager found it difficult and time consuming to find and source foods that fit within the CMO category, especially those that would also appeal to consumers.

2) Communication and influence

Champions: The facility manager consistently attributed limited implementation of the ANGCY to the absence of an influential champion who could move things forward.

Interorganizational knowledge sharing: The facility manager had sought to learn from the experiences of other facilities that had adopted and implemented nutrition guidelines, but was unable to locate any such facilities.

3) Organizational antecedents for the ANGCY

Managerial attitudes: Managers' overall positive attitudes toward change, supportive relationships with each other and their staff, and willingness to accept some financial risk were key facilitators of implementation.

Absorptive capacity for new knowledge: Implementation of the ANGCY in the concession was greatly facilitated by its corporate nutrition program with provisions and standards similar to the ANGCY.

4) Readiness of the recreational facility to implement the ANGCY

Assessment of implications: While implementation of a nutrition policy had made it easier to eat healthfully within the facility, observations made by managers and researchers suggested that children were not purchasing healthier items as a result. Negative implications of the policy were particularly evident when each weekday, students from the 2 neighbouring high schools came to the facility to purchase primarily unhealthy foods for lunch because their schools' restrictive nutrition policies meant that only CMO items were available on school grounds. Conversely, the choice-based format of the recreational facilities' nutrition policies allowed healthy and unhealthy items to be sold concurrently. The negative financial implications of a restrictive policy were expected to be even more problematic, however, and therefore the choice-based policy was maintained.

Fit of the ANGCY with the recreational facility context: The ANGCY fit within the organization insofar as they enabled it to satisfy the food-related expectations of its health-conscious patrons, but they were not compatible with its goal of profitability. Adoption of a choice-based nutrition policy was the mechanism through which they balanced these competing mandates within a socio-political framework of individual responsibility for food choices.

Power balances: Although it was challenging to reconcile their respective choice-based and restrictive nutrition policies, continued interaction and dialogue between the recreational facility and the School Boards helped to sustain implementation. There was no overt opposition to implementation, although apathy was evident among staff who failed to 'buy-in' to the initiative, in the failure of food vendors and the municipality to prioritize child health, and among patrons who, by virtue of their buying power, demonstrated indifference toward the facility's efforts through continued purchase of unhealthy items.

5) The processes of assimilation and implementation

Complex, non-linear process: Collectively, all managers perceived adoption as a simple matter, whereas implementation was described as much more challenging. Although the choice-based policy had greatly facilitated adoption of the ANGCY, the model had become an important barrier to achieving meaningful change within the facility's food service. Indeed, all managers readily admitted that relatively little had changed under the policy. Healthy options had always been available, implementation of the ANGCY-based policy simply meant there were now more of them. Meanwhile, unhealthy foods continued to dominate the food landscape. The manager therefore, sought to transition to a restrictive policy with 'teeth' and impact. Such a move, however, required a new business model that did not rely on food service revenues and the manager remained skeptical that stakeholders would support this change.

Dedicated time and resources: Staff and managers faced significant time pressures with respect to implementing the ANGCY. The near absence of supportive tools, resources and persons specific to the recreational facility context also constituted an important barrier to implementation.

Feedback and monitoring: ANGCY implementation was not monitored and therefore managers were unsure whether food vendors were adhering to the terms of their contracts. This contributed to the atmosphere of ambivalence surrounding the ANGCY, as no one could be certain whether their efforts to adopt and implement them had been worthwhile.

4.4 Discussion

The use of mixed methods within this study added a depth and breadth to findings that could not have otherwise been achieved. Overall, study findings suggest that the facility was relatively successful in implementing the ANGCY, as the nutrition environment exhibited many healthy characteristics according to qualitative findings and the NEMS-R and ANGCY implementation scores. Areas for improvement remained, however, as food availability scores, observations and interviews revealed that the balance of items was

still heavily weighted toward unhealthy options, a finding not captured by the NEMS-R or ANGCY implementation scores. As demonstrated by Naylor et al [15], positive change in recreational facility food environments can be achieved within a relatively short time frame, provided that facilitation, resources and support are provided. Provision of these needs may therefore enable greater change in this setting, a conclusion supported by qualitative findings from the current study.

Importantly, observations made by researchers and managers revealed that the changes in this facility's food environment had little impact on children's food purchasing decisions. Poor sales [5, 7, 22] and lack of demand for healthier items [23] have been reported as important barriers to offering healthier options in other studies conducted in recreational facilities. In 8 recreational facilities in British Columbia, despite a 20% increase in availability of healthier items in vending machines and other measures to promote sale of healthier items, three quarters of patrons reported that their food purchases were unchanged [12, 15]. Empirical evidence from other settings confirms that increasing the proportion of healthier options is unlikely to influence children's dietary behaviors when the preponderance of items continue to be nutrient poor, high calorie items [24, 25]. Environmental interventions are most effective when they make healthy options available, and restrict availability of unhealthy options [24-26]. Thus, the proportion of CMO options within the facility may have been insufficient to noticeably improve children's dietary behaviors. Many provincial nutrition guidelines, however, including the ANGCY, permit sales of unhealthy items as long as some healthy options are available, which explains why the ANGCY implementation scores were high despite limited availability of healthy items. Future studies should investigate whether guidelines formulated in this manner can improve children's food purchasing decisions. Moreover, although the ANGCY address many barriers to healthy eating, more comprehensive measures at multiple ecological levels may be required to overcome a wider range of barriers that children encounter.

The choice-based format of the ANGCY-inspired nutrition policy may have done little to improve children's dietary behaviors, however it was an important facilitator of ANGCY adoption, as few stakeholders would have supported a restrictive nutrition policy. Thus, it may be advantageous to adopt a staged approach to nutrition policy implementation. Under this approach, healthy and unhealthy foods could be sold concurrently for a time. As healthy foods become integrated within the food environment and stakeholder support builds, policies could be strengthened to a restrictive format that supports improved dietary behaviors. Similarly at the provincial-level, the current format for the ANGCY may be optimal at this early stage. Once a critical mass of adopters is reached the ANGCY should be strengthened such that they recommend and/or mandate elimination of unhealthy options.

This qualitatively-driven case study was grounded in principles of analytic generalization, which seeks to expand and generalize theories [27]. Thus, study findings are not representative of all recreational facilities in Alberta. Greenhalgh's diffusion theory provided a highly useful framework for distilling and synthesizing the factors important to adoption and implementation of the ANGCY in this setting. Findings suggest that future studies can use Greenhalgh's theory to inform points of

intervention, potentially leading to stronger effects than interventions with no theoretical basis [28].

This study has limitations. Specific nutrition information for all menu items was not available from the concession, and therefore some of this information was obtained from a nutrient database, providing a more generic nutrient analysis. The tool used to assess ANGCY adoption and implementation has not been fully tested for construct validity, however preliminary findings indicate good congruence with the NEMS-R measure and ability to distinguish ANGCY adopters from non-adopters. Quantitative sales data were not available to substantiate the finding that children's food purchases were primarily unhealthy, however this observation was attested to by multiple managers and researchers.

Individual behavior to make healthy dietary choices can only occur in supportive environments with accessible and affordable healthy food choices. Unhealthy food environments, by contrast, subvert informed and responsible food choices, and undermine the health messages that parents and other adults communicate to children. The ANGCY represent a collective approach to the problem of childhood obesity that, by making healthy options available, may help to improve children's diets. The ANGCY may therefore offer an effective complement to individually-oriented strategies within a larger ecological approach to obesity prevention. Findings suggest that implementation of the ANGCY supported creation of a healthy food environment, although a higher proportion of healthy foods may be needed to support improved dietary behaviors among children.

4.4.1 Relevance to practice

Growing recognition of the need to improve children's food environments offers new avenues for dietetic practice. Findings from this study highlight areas in which dietitians might fruitfully support the efforts of recreational facilities to adopt the sale of healthier items, can inform future points of intervention for dietitians working in policy, practice and research settings, and will contribute to a body of knowledge surrounding the optimal formulation for nutrition guidelines.

4.5 Tables

Table 4.1 Major components of Greenhalgh et al's conceptual model for considering the determinants of diffusion, dissemination and implementation of innovations in health service delivery organizations. Based on a systematic review of empirical research studies [14].

	Framework components	Description
	Attributes of the innovation	Perceived attributes of the innovation that help to explain variance in adoption rates
Elements of the user system	Organizational antecedents for innovation	General features of the organization that make it more or less innovative
	Organizational readiness for innovation	Readiness and/or willingness of the organization to adopt a particular innovation
	Adoption process	Influential aspects of adopters and adoption as a process
	Processes of assimilation	Organizations may move back and forth between initiation, development and implementation of the innovation
	Implementation process	Specific steps taken to put a decision into practice
	Communication and influence Diffusion and dissemination	Means of spreading the innovation
	Outer context	External influences on the organization's decision to adopt and innovation
	Linkage between developers and users	Connections that facilitate movement of the innovation from the resource system to the user system

Table 4.2 Theoretically-informed, semi-structured interview guide.
Questions were initially asked to open up areas of inquiry, and were followed by targeted probes when required. Theoretical domains addressed by each question are listed in brackets. The domains for the probes are the same as for the parent question except where otherwise indicated.

1. What is the history of the facility and its food service?
2. Can you describe your role within the organization?
3. Tell me about when and how you first learned of the ANGCY. (Communication and influence)
4. How did you come to believe it was important for you to adopt and implement the ANGCY? (Communication and influence)
5. Who made the decision to adopt the ANGCY? (Adoption process)
    a. How was the decision made?
    b. When was the decision made?
    c. What reasons were given?
6. Thinking about adoption, which is a one-time mental decision to use the ANGCY, what were the barriers to adopting the ANGCY? (Adoption process)
    a. Which were the most important?
    b. How did you address these barriers? How could these barriers to overcome?
7. What things made it easier to adopt the ANGCY? (Adoption process)
    a. What was the most important factor?
    b. What things would have made it easier to adopt the ANGCY?
8. How did you go about developing nutrition policies? (Adoption process)
9. Thinking about implementing the ANGCY, which are the concrete steps to put the ANGCY into practice, what are all the things you had to do to implement the ANGCY? (Implementation process)
    a. Which aspects of the ANGCY did you implement and why?
        i. What changes did you make to the ANGCY during implementation? (Attributes of the innovation)
        ii. Did you implement any of your own nutrition policies/programs that were not part of the ANGCY? (Attributes of the innovation)
        iii. What aspects of the ANGCY did you want to implement but were unable to? (Organizational readiness for innovation)
    b. What resources did you have already and what resources did you have to acquire to be able to implement the ANGCY? (Organizational antecedents for innovation)
    c. How did you communicate changes to your staff, and how did they provide you with feedback on the changes? (Communication and influence)
    d. What was the timeline?
    e. What do you define as successful implementation?
10. What were the barriers to implementing the ANGCY? (Implementation process)
    a. Which were the most important?
    b. How did you address the barriers to implementation?
11. What things made it easier to implement the ANGCY? (Implementation process)

    a. Which were the most important?
    b. What things would have made it easier to implement the ANGCY?
12. What factors in the wider environment helped/hindered adoption and implementation? (Outer context)
13. Can you describe the internal and external support and opposition you had throughout adoption and implementation? (Organizational readiness for innovation)
14. In what ways did the ANGCY fit/not fit with your values and priorities? (Organizational readiness for innovation)
15. In what ways did the ANGCY fit/not fit with your ways of working and skill sets? (Organizational readiness for innovation)
    a. What changes did you make to your ways of working to better fit the ANGCY?
16. How do you make sure the ANGCY continue to be followed? (Processes of assimilation and implementation)
17. What outcomes have you observed from implementing the ANGCY? (Attributes of the innovation)
18. As you look back on adopting and implementing the ANGCY, are there any other important factors that stand out in your mind? (Assimilation process)
19. What advice would you give to a recreation facility manager who is deciding whether to adopt/implement the ANGCY? (Assimilation process)
    a. What, if anything would you do differently next time?
20. What are your future plans with respect to the ANGCY? (Assimilation process)

Table 4.3 Comparison of the Alberta Nutrition Guidelines for Children and Youth with selected segments of the recreational facilities' nutrition policy and food service contracts

ANGCY recommendations	Choice-based nutrition policy	Concession contract	Vending machine contract
Healthy (CMO) options in all vending machines	≥ 25% of vending machine items are healthy according to Canada's Food Guide		≥ 25% of total vending machine items are CMO
Healthier items competitively priced	Healthier items competitively priced, no premiums on healthier items, healthy items put on sale	No premiums on CMO options, lower profit margin on CMO options compensated for by an increased profit margin on CS and CLO items	No premiums on CMO options, lower profit margin on CMO options compensated for by an increased profit margin on CS and CLO items
Healthier items prominently displayed	Healthier items prominently displayed, advertised in same or more visible manner than unhealthy items	Healthy (CMO) items prominently displayed, placed in high profile locations, advertising features CMO options more prominently than CS and CLO options	Healthy (CMO) items placed in high profile locations
Healthier items attractively packaged	Healthier items attractively displayed	Healthy (CMO) items attractively packaged	
Healthier items convenient	Healthier items displayed alongside food of similar types		
Healthier items fresh			
Portion sizes consistent with Canada's Food Guide	Portion sizes consistent with Canada's Food Guide, child friendly portions available		
Snack items have 100 calories per package	Less healthy options sold in small portions		
Milk and 100% fruit/vegetable juice	Milk and 100% fruit/vegetable	Healthy food/beverage	Not permitted to sell milk

available	juice available, choices for lower fat dairy should be available	choices (CMO) always available	
Water always available		Healthy food/beverage choices (CMO) always available	
Unprocessed fruits and vegetables always available	Unprocessed fruits and vegetables always available	Healthy food/beverage choices (CMO) always available	Not permitted to sell fruit and vegetables
Whole grains always available	Nutrient-rich cereals, breads and other whole grains available	Healthy food/beverage choices (CMO) always available	Not permitted to sell grain products
Lean meats, poultry, beans, lentils, plain nuts always available	Choices for leaner meats should be available	Healthy food/beverage choices (CMO) always available	Not permitted to sell meat and alternatives
Mixed dishes contain a whole grain (if grains present) and are low in fat, sugar, salt		Healthy food/beverage choices (CMO) always available	
	Foods prepared with little or no fat should be available		
	Reduced salt and caffeine options should be included		
	Eliminate products containing trans fats		
	Nutrition information available upon request		
	Establish an identifiable rating system to showcase nutrient rich foods	Establish an identifiable rating system to showcase nutrient rich foods	
	Include nutrition standards in programs and services, develop		

	and support initiatives that encourage healthy lifestyle choices		
		Food/beverage service is mindful of the environment	
			Vending may only sell soft drinks, bottled water, sports drinks, juice, hot beverages, frozen novelties, and packaged snack foods

ANGCY: Alberta Nutrition Guidelines for Children and Youth; CMO: choose most often; CS: choose sometimes; CLO: choose least often

Table 4.4 Assessment of the food environment of vending machines

	Beverage vending (n=8)	Food vending (n=4)[b]	Total vending (n=12)
Availability of CMO items[a]	31%	2%	20%
Availability of CS items[a]	4%	8%	5%
Availability of CLO items[a]	65%	90%	75%
ANGCY implementation score	77%	64%	
Average nutrient profile	126 kcals, 0% fat, 98% carbohydrate (28g sugar, 0g fibre), 3% protein	216 kcals, 42% fat, 54% carbohydrate (13g sugar, 1g fibre), 6% protein	

[a]Availability was assessed on 2 occasions and the average used, values represent % of shelf space

[b]Non-food items (eg. lozenges, breath mints) were excluded from the analysis

CMO: choose most often; CS: choose sometimes; CLO: choose least often

Table 4.5 Assessment of the food environment in the concession

	Main dish and side items[b]	Snacks and desserts	Beverages	Total
Availability of CMO items[a]	23%	7%	16%	16%
Availability of CS items[a]	18%	9%	2%	11%
Availability of CLO items[a]	59%	85%	81%	73%
ANGCY implementation score				75%
NEMS-R score				+ 28

[a]Food and beverage availability in the concession did not differ throughout the case study and therefore only a single assessment was required, values represent % of total items available

[b]83% of the items deemed to be healthy options within the company's corporate nutrition program met the Alberta Nutrition Guidelines for Children and Youth criteria for choose most often

CMO: choose most often; CS: choose sometimes; CLO: choose least often

Table 4.6 Selected quotations from managers

Factors influencing implementation of the ANGCY	Quotation
Attributes of the ANGCY	
Relative advantage	"You can't just cut them off and say 'Sorry, you're in the fatty food business, we're not going to talk to you anymore', because…it's also the community that we would be kicking…without them sponsoring hockey teams you don't have those kids getting activity, so you know they're balancing it out".
Complexity	"I just wish it was cut and dry and tell us – tell us what products we can put in it, you know? But right now I've got to go read every package and try and match it up. And I've got other things to do, you know? I can't just sit there and read labels all day... If they told me what I could put in, then it would be easier."
Communication and influence	
Champions	"It goes back to not having a champion who's dedicated to moving the initiatives further... I wish there was someone further up the ladder who was more passionate or interested in it, because then it would probably move... there's nobody leading the charge".
Interorganizational knowledge sharing	"It was really frustrating to me that there wasn't a lot of Canadian stuff out there that you could say, 'Well, look at how it's working'. I had reservations about what it would mean to revenue streams, public reaction, there's a few things that concerned me. So I really wanted to go and hear from other people who had done it. What the pitfalls were, what the successes were and the opportunities. I just couldn't".
Readiness of the recreational facility to implement the ANGCY	
Fit of the ANGCY with the recreational facility context	"We need to balance what's sustainable in terms of support for the facilities because we get revenue or other assets from the sale of [unhealthy foods] at our facilities,

	and balancing our philosophy and our beliefs in terms of healthy lifestyles... We're on a teeter-totter... [we] can't do one without affecting the other one... like you start taking away the revenue and all of a sudden your fees go up and... so now you've got kids eating healthy but they're not going in to swim".
The processes of assimilation and implementation	
Complex, non-linear process	"I really think that we've missed the mark with implementing... It's one thing to have it in paper and contracts but it's another thing to deliver it... Like, it's not as simple as writing a policy and people picking it up. It just doesn't work that way".

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CHAPTER 5: Adopting and implementing nutrition guidelines in recreational facilities: Public and private sector roles. A multiple case study

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5.1 Introduction

Historically, obesity prevalence was low and relatively unchanging among children, however, in nations that regularly monitored population-level height and weight statistics, an upward trend in the prevalence of childhood obesity emerged in the 1970s and 1980s [1]. Although recent data suggest it may now have slowed or even plateaued in some nations [2], the continued high prevalence of obesity threatens to reduce the life expectancy of the current generation of children below that of previous generations [3].

The causes of overweight and obesity are multifactorial. A socio-environmental paradigm provides a framework for understanding obesity as a consequence of the complex and dynamic interplay between individuals (including biological and behavioral factors) and their environments. Children may be particularly vulnerable to obesity-promoting environmental influences, given that they have little autonomy and adults determine the content of their environments. Empirical evidence now confirms that social, physical, economic [4-6], and political aspects [7,8] of children's food environments influence their dietary behaviors and body weights. Policy has proven to be a powerful means of shaping the environmental conditions that affect health [9,10], and is therefore increasingly being used as a strategy to reduce children's exposure to unhealthy, obesity-promoting food environments.

Progress in using policy to reduce children's exposure to unhealthy food environments in schools [8,11] has generated interest in using similar strategies to improve recreational facility food environments, as despite their health mandate, many have unhealthy food environments that may paradoxically increase the risk of childhood obesity [12-17]. Indeed, a recent systematic review found no clear association between body weight and youth sports participation, a finding that may be related to direct access to excess calories in sport settings [18]. Several Canadian cities [19-21] and provinces [15,22-24] have therefore mandated or recommended that recreational facilities adhere to nutrition guidelines. These initiatives have had limited success [21,25], although a recent study showed potential for small positive change when significant support was provided to recreational facilities [15].

In Alberta, Canada, the Alberta Nutrition Guidelines for Children and Youth (ANGCY) are voluntary, government-issued guidelines intended to facilitate children's access to

healthy food and beverage choices within schools, childcare and recreational facilities [22]. Findings suggest that 1 year following their release, awareness, adoption and implementation of the guidelines was low in recreational facilities [16]. Although some of the factors inhibiting the use of nutrition guidelines in recreational facilities have been identified [14-16], they have not been examined in an in-depth manner. It is also unclear from these studies which factors are the most influential and might be sufficient to dissuade or compel adoption and implementation of nutrition guidelines in various contexts. Therefore, we sought to take advantage of this natural experiment by investigating the factors that facilitated and acted as barriers to adopting and implementing the ANGCY in recreational facilities in an in-depth way. Specifically, we used mixed methods within an exploratory multiple case study to answer the following 2 questions: 1) What is the nature of the food environment within recreational facilities that have and have not adopted the ANGCY? 2) What factors influenced adoption and implementation of the ANGCY within these recreational facilities? We define adoption as a one-time mental decision to follow the ANGCY, whereas implementation refers to multiple acts that must be repeated over time to put the decision into practice [26].

5.2 Methods

5.2.1 Study design

5.2.1.1 Theoretical framework

Diffusion is a process whereby an innovation is communicated over time among the members of a social network [26]. It is a social process consisting of interpersonal network exchange and social modeling by adopters to those who are influenced to follow their lead [26]. Diffusion of Innovations can provide a conceptual basis for understanding how and why the ANGCY spread or failed to spread among recreational facilities in Alberta, as, because they are not mandated policy, their adoption is not assured, and given their limited formal dissemination, spread is likely to occur via informal, social means. Whereas classical Diffusion of Innovations theory describes the adoption of simple product-based innovations by individuals [26], Greenhalgh et al's [27] systems approach models the transfer of complex process-based innovations in organizations (Table 5.1). The comprehensiveness and utility of the model is attested to by the work of others who have conducted similar reviews and/or who have used the model to structure investigations [28-31].

5.2.1.2 Case selection

Potential cases were identified from the results of a randomized provincial telephone survey of publicly funded recreational facilities [16]. Three cases were purposefully chosen based on their conformity to 1 of 3 types. An ANGCY full adopter was defined as a facility that had adopted and implemented the ANGCY within its concession(s) and vending machines, while a non-adopter was defined as a facility that had decided not to incorporate ANGCY recommendations into any of its food service operations. A semi-adopter was a facility that was following ANGCY recommendations in its vending machines or in its concession(s), but not both. S. At the time of the study there was 1 known full adopter in the province, of a total of approximately 1020 recreational facilities that served food. We were aware that approximately 50 other recreational

facilities were offering healthier choices in their vending machines only, although it is not known whether, or to what extent most were using the ANGCY. From these facilities we selected one that was using the ANGCY to a significant extent. A non-adopter was selected based on proximity to the University of Alberta. For simplicity, and consistent with Diffusion of Innovations terminology, we refer to cases in terms of their adoption status as adopters (full adopter and semi-adopter) and the non-adopter. An in-depth case study of the full adopter has been previously published [32].

5.2.1.3 Ethical approval

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and received ethical approval from the Human Research Ethics Board at the University of Alberta. Informants provided written, informed consent prior to participating in this study. To protect the identity of participants, descriptions of the setting are of a general nature and do not include details that might lead to identification of the cases.

5.2.2 Data generation and analysis

Data generation and analysis were completed concurrently to permit exploration of emerging themes and adjustment of data gathering instruments and procedures. Mixed methods were used for purposes of complementarity and triangulation, while maintaining an overall qualitative drive. When mixed methods are used for the purposes of triangulation and complementarity (ie. component designs), the different methods typically remain independent during data collection and analysis, and are integrated during interpretation [33]. Accordingly, each data source was first analysed independently by a single investigator as described below. A case study database was established to organize and document the chain of evidence, and thorough records of the data gathering and analytical process were also maintained [34,35].

5.2.2.1 Questionnaire

A written questionnaire was sent to each recreational facility manager as the first step in data generation. The questionnaire's 37 closed and open-ended questions were designed to address discrete aspects of the theoretical framework to identify areas for subsequent qualitative exploration and to collect relevant contextual details. The content of the questionnaire was reviewed by experts in health promotion and nutrition, and by relevant government officials. Quantitative and categorical responses provided by managers were transformed into narrative descriptions for directed content analysis using the coding scheme (described below).

5.2.2.2 Qualitative assessments

Interviews

The theoretical framework and insights from questionnaire analysis guided development of a semi-structured interview guide. The guide was pilot tested with 2 managers, and subsequently expanded to ensure that all domains of the framework would be adequately addressed through participation in an interview and completion of a questionnaire. Managers responsible for food service within each recreational facility

(n = 5) participated in one to two semi-structured in-person interviews lasting between 50 and 90 minutes. Corroborating evidence and a variety of perspectives were sought by interviewing managers from industry within each facility (n = 7). All interviews were digitally recorded and transcribed verbatim.

Observations

Two to three 30 minute observation periods were conducted by 2 independent observers during different days and times of day at each facility. Observers were guided by a theoretically-informed observation guide to make 'grand tour' and 'mini-tour' observations [36], the former being more open-ended and the latter more specific to the elements of the theoretical framework. Observations were transcribed. Photos of the food environment were also taken within each facility.

Document reviews

A review was conducted of general administrative documents related to each case including policies, food service contracts, goals, objectives and strategic plans. Printed and online sources of municipal statistics were consulted to abstract contextual and organizational variables.

Analysis of qualitative data

Directed content analysis is used to validate or conceptually extend a theoretical framework [37] and was therefore highly appropriate in the current study. Using this approach, the theoretical framework guided development of an initial coding and categorizing scheme and operational definitions for the codes [37]. Another member of the research team inspected the coding scheme to ensure congruence with the elements of the theoretical framework. A single investigator applied the identical coding and categorizing scheme to all qualitative data using techniques of memoing, constant comparison and questions. NVivo software (v.9, QSR International, Cambridge, MA) was used to organize the data during analysis.

5.2.2.3 Quantitative assessment of the food environment

Food and beverage availability

Food and beverages available within vending machines (items designated as: food, beverages) and concessions (items designated as: main dish items and sides, snacks and desserts, beverages) were recorded and classified according to ANGCY criteria for 'choose most often' (consume daily), 'choose sometimes' (≤ 3 servings/week), and 'choose least often' (≤ 1 serving/week) [22] on the basis of nutrition information obtained from food vendors, package labels, company websites, directly from manufacturers, and where necessary from the Canadian Nutrient File and Food Processor SQL (ESHA Research Inc, Salem, OR). The number of 'choose most often', 'choose sometimes' and 'choose least often' items available was then expressed as a percentage of the total number of items available for sale.

Nutritional profile of vending machine items

Nutrition information for all items within vending machines was obtained from package labels, company websites or directly from the manufacturer. Nutrients present within all vending machine items were then added to derive a total for each type of machine according to shelf space, and an average was derived representing the average nutrient content for a typical item from food and beverage vending machines [38].

Nutrition Environment Measures Survey in Restaurants (NEMS-R) assessment

The NEMS-R is a validated observational instrument that provides a comprehensive and quantitative assessment of factors that contribute to food selection in restaurants, including availability of healthy items, barriers and facilitators to healthy eating, pricing, signage and promotions [39]. The same trained researcher completed the NEMS-R in the concession(s) of each facility and determined the NEMS-R score (possible range: -27 to +63) according to the standardized protocols of Saelens et al [39].

ANGCY adoption and implementation scores

ANGCY adoption and implementation scores from 0 to 38 were assigned by 2 raters on the basis of direct observations and review of menus and policies. Each scoring system consists of up to 19 policies or environmental characteristics recommended in the ANGCY (eg. healthier foods should be available, convenient, visible) [22], for which facilities received a 0, 1, or 2 according to whether the policy or environmental characteristic was present (1 = partially present, 2 = fully present) or absent (0), with a higher score indicating greater congruence with the ANGCY. Discrepancies between raters were resolved through discussion to arrive at a mutually agreed upon score.

Qualitative observations were also recorded for each of the content items. The adoption score indicates whether facilities have formally adopted ANGCY recommendations through developing nutrition policies, while the implementation score provides a quantitative assessment of food environment quality and the degree and fidelity of ANGCY implementation. Development of the scoring systems was informed by the Robert Wood Johnson Foundation's School Wellness Policy Coding Tool [40]. Researchers and government officials involved in developing the ANGCY assessed the content validity of the scoring systems and judged them to be congruent with ANGCY recommendations. The scoring systems were pilot-tested in one facility by 2 raters for reliability and to clarify decision rules. The total ANGCY adoption and implementation scores were derived by summing the scores for individual content items. Scores were expressed as a percentage of the total possible score.

Data transformation

To facilitate cross-case comparisons of the food environment, for each food environment assessment tool the range of possible scores was divided into quintiles where the top quintile (ie. 81-99%) corresponded to a rating of 'very high/healthy', followed by 'healthy/high', 'moderately healthy/high', 'limited' and 'very limited'.

5.2.2.4 Sales

Sales data were requested for the concession(s) and vending machines in each facility, however itemized sales data were only provided for non-adopter concessions. Annual sales of 'choose most often', 'choose sometimes' and 'choose least often' items in those concessions were expressed as a percentage of total sales.

5.2.2.5 Within case report

Following analysis of individual data sources, quantitative and qualitative data were integrated into a single case study data set, and jointly interpreted to produce each case report. Merged data analysis strategies were used, involving side-by-side comparison of qualitative and quantitative data displayed in tables to identify areas of convergence and divergence [41]. Pattern matching [35] was used to explore the fit of the elements of each case with the theoretical framework and to derive propositions for testing during subsequent cases. Member checking [34] strengthened the credibility of findings, whereby feedback from facility managers was obtained and used to verify the facts of each case prior to finalizing each case report. The final case report for each site distilled and synthesized the entire data set into a single, coherent, in-depth narrative and was finalized prior to conducting new cases.

5.2.2.6 Cross-case analysis

The set theoretic approach formed the basis of our cross-case analytic strategy. In contrast to multivariate techniques which assume causal homogeneity, set theoretic logic assumes that there are multiple causal paths to the same outcome, with some factors being sufficient and others necessary [42]. We maintain that this logic is likely to have a greater affinity with the complex causality that characterizes obesity than standard regression models [42].

Case-oriented pattern matching was initially used to produce a narrative synthesis comparing and contrasting findings among cases for each aspect of the theoretical framework. There was a marked degree of congruence in influential factors between the semi-adopter and the full-adopter facilities, and thus they were grouped as adopters where appropriate. Then, in accordance with set theoretic logic and procedures described by Savaya et al [43], areas of convergence and divergence between adopters and the non-adopter were identified, explored, and used to finalize the final set of cross-case propositions. Findings were generated via an iterative, abductive cycle, moving back and forth between inductive and deductive reasoning, checking for consistency between emerging patterns and data derived from individual cases, and revising interpretations where indicated.

Long-term follow up

Prior to finalizing the multiple case study, managers were contacted to determine whether their ANGCY adoption status had changed, and to obtain information regarding any nutrition-related changes that had been made subsequent to each case study.

5.3 Results

5.3.1 Context

The multiple case study was conducted in the province of Alberta, Canada. Recreational facilities are ubiquitous throughout urban and rural Alberta. The available infrastructure varies among facilities, but typically includes swimming pools, ice arenas, soccer centres, curling rinks and/or gymnasiums. Approximately 80% of publicly funded recreational facilities in Alberta sell food as a means of generating additional revenue, most commonly through vending machines, however many facilities also contain publicly or privately operated concessions. Features of the recreational facilities included in this study are presented in Table 5.2. The adopter and semi-adopter cases were each limited to a single facility, however the non-adopter case included observations from 4 small recreational facilities where food services were managed by a single manager.

5.3.2 Food environment quality

There were differences in the quality of items present within vending machines among facilities that had and had not adopted the ANGCY (Table 5.3). Compared to non-adopter facilities, facilities that had adopted the ANGCY in vending machines had higher ANGCY implementation scores for food vending machines, greater availability of 'choose most often' items, and their vending machine items contained fewer calories on average. Notably, all food vending machines contained few 'choose most often' items, as few were available that could be sold in unrefrigerated vending machines. Nevertheless, the semi-adopter attempted to provide healthier choices in food vending machines by filling them primarily with 'choose sometimes' items (77% of food items were 'choose sometimes'). Beverage vending machines scored better than food machines on all measures. Comments from managers revealed why this was the case, as bottled water was a top selling item, and therefore it was in the financial interests of food vendors to place this healthy item in machines.

There were few clear differences in food environment scores between concessions that had and had not adopted the ANGCY (Table 5.4). The only concession that had adopted the ANGCY scored well in terms of the overall quality of its food environment, with high NEMS-R and ANGCY implementation scores, yet it provided a very limited proportion of healthy items. Most other concessions that had not adopted the ANGCY also scored highly in terms of the quality of their food environments, and had a similarly low proportion of 'choose most often' items available, making them virtually indistinguishable from the adopter. An arena concession, a non-adopter with no availability of 'choose most often' food items, stood out as having the poorest quality food environment, with consistently low scores on all measures.

Interviews and observations provided new dimensions for understanding quantitative findings regarding the quality of the food environment. Agreement was good overall in that managers generally recognized the need to improve the quality of the food environment within their facilities, however in some instances managers perceived they had more healthy options than they actually did. Observations revealed evidence of

action on the part of adopter facilities, but also showed just how prominent unhealthy food was within these facilities that claimed to promote healthy lifestyles. Access to food was particularly high in the case of the semi-adopter, with concessions on both floors, and a large number of vending machines throughout the facility. These findings highlight the value of using multiple modes of data collection.

5.3.3 Sales

Facilities that had implemented the ANGCY perceived that food and beverage sales had fallen as a consequence. In the semi-adopter, the commission they collected on vending machine sales decreased by 16% from 2009 to 2010, and they anticipated a further decline of 14% in 2011. Similarly, in the full adopter facility, annual sales decreased by 17% in the concession from 2009 to 2010 and the vending machine operator estimated that revenues had declined by 20% since implementation began. Data capture systems were too limited to accurately depict the proportion of revenue declines attributable to ANGCY implementation, and which might have been due to other factors such as the economic recession or declines in facility usage. The inability to disentangle the impact of each of these factors was a barrier to greater implementation of the ANGCY, as managers assumed that increasing the proportion of 'choose most often' items might further reduce profitability. Notably, annual revenues in 2 non-adopter concessions declined by 5% and 9%, respectively, over the same period, declines that the manager attributed to reduced facility usage. Table 5.5 presents industry's perceptions of food service sales.

Comparison of sales of healthy and unhealthy items was only possible in 2 non-adopter concessions as others did not provide itemized sales data. In one, a pool café, sales of healthy options closely mirrored their availability, as 17% of menu items available, and 14% of items sold were 'choose most often'. In the other, an arena concession, 11% of items available were 'choose most often', while 4% of items sold were 'choose most often'. Of the top 15 food and beverage items sold in the pool café, only 2 were 'choose most often' (water, juice), whereas none were 'choose most often' in the arena concession. Observations made by researchers and managers in all facilities supported findings of low sales of 'choose most often' items, and in particular it was noticed that students from nearby schools came to the full adopter facility at lunch to purchase the unhealthy items they could not purchase on school grounds.

5.3.4 Impact of factors on adoption and implementation of the ANGCY

5.3.4.1 Factors common across all cases

The comparative analysis was aimed at distinguishing the factors that determined whether or not adoption and implementation occurred, and mirrors the presentation of findings by Savaya et al [43]. First, in Table 5.6 we detail factors from the theoretical framework that had a similar impact across all cases, acting as barriers, facilitators or neither within all of the facilities. Because they acted in a similar manner across all cases, the barriers in this list were therefore not strong enough to dissuade adoption and implementation, nor were the facilitators strong enough to compel adoption and implementation. We cannot conclude that these factors are not necessary to adoption

and implementation, only that their presence, in the case of facilitators, or absence, in the case of barriers, is not sufficient for adoption and implementation to occur. A cause is sufficient if it is invariably (or almost invariably) followed by the outcome, whereas it is necessary if it is present in all instances of the outcome [44].

5.3.4.2 Factors unique to individual cases

Next, we describe factors from the theoretical framework that were influential for adoption and implementation, but were unique to individual cases. These factors may be important for adoption and implementation in particular contexts, and are therefore sufficient, but not necessary for adoption and implementation.

Organizational antecedents for the ANGCY

Formalization: Adopters contracted out their food service and as a result had to work within the constraints of food vendors whose values differed from their own. The multi-year nature of these contracts also committed them to particular courses of action for several years at a time. Thus, expiration of their 3 and 5 year concession and vending machine contracts, respectively, provided much of the initial impetus for adopting the ANGCY in the full adopter facility: "I really think I was motivated solely by the expiration of contracts and it was sort of a do it now or lose [many] years of opportunity… So I was kind of spurred on by the fact that it was kind of now or never." The manager seized this window of opportunity to develop new vendor contracts that required adherence to the ANGCY.

Conversely, food service contracts were a major barrier to adoption for the semi-adopter, which was nine years into its 20 year food service agreements that allowed food vendors to sell virtually what they liked. Therefore, had its vending machine company not agreed to adopt the ANGCY, the facility would have remained a non-adopter for another 11 years. The degree of formalization was low within non-adopter facilities, as their concession-based food services were publicly delivered by the municipality and industry was not involved. The concession manager felt that the low degree of formalization had not impacted the decision not to adopt the ANGCY.

Organizational readiness for the ANGCY

Power balances: If supporters of adoption are more numerous and strategically placed than opponents, the ANGCY are more likely to be assimilated [27]. The support of powerful persons and organizations proved to be key facilitators of adoption. Within adopter facilities, the support of facility and municipal leaders was a key prerequisite for adoption and implementation of the ANGCY. These individuals determined in what format the ANGCY would be implemented, either one based in choice (where all foods could be sold) or in a restrictive format (where unhealthy foods could not be sold). The support of food vendors was also essential to adoption and implementation. Public sentiment was influential in adopters' decision to adopt the ANGCY in a choice-based format, but was accorded less importance within the semi-adopter facility.

Encouragement by local School Boards to adopt the ANGCY was an important catalyst for adoption within the full adopter facility. Given the proximity of the recreational facility to 2 high schools, the manager wanted to support the School Boards' efforts to adopt the ANGCY by using them as well: "A facilitator also has been the pressure that's been put on by the School Boards to do different… [they] were leading the charge… and we felt that we needed to support and/or follow that so it wasn't just them out on a limb…" However, while most stakeholders preferred that the ANGCY be adopted in a choice-based format, School Boards wanted the facility to adopt the ANGCY in a restrictive format similar to their own. Although the facility did not ultimately adopt restrictive policies, continued interaction and dialogue between the recreational facility and the School Boards helped to sustain implementation. Schools were similarly influential in the adoption decision of the semi-adopter, which was strongly encouraged to adopt the ANGCY by a teacher who was also a member of the facility's governance Board.

Adopters did not experience any overt opposition because adoption was limited in scope. Managers predicted that strong opposition would have emerged had they removed all unhealthy items from the facilities: "There's no opposition because we [allowed] choice. There's no threat because they can still sell what they want to sell. Yeah, I've felt no opposition." The support of food vendors was, however, waning in the face of mounting revenue losses. In addition, apathy was a concern for the full adopter, as although his municipality verbally supported implementation, it had not made child health a priority: "I don't think it ever became a priority for municipal government. So I'm one person, fairly far down the food chain… and so it's like a fish trying to swim upstream when you're just one person trying to effect change, you don't have a whole bunch of time to commit to it, but you want to make some sort of impact… I wish there was someone further up the ladder who was more passionate or interested in [the ANGCY], because then it would probably move…"

The menus of non-adopter concessions reflected the fact that customers, through market forces, held the balance of power within these facilities. The manager was highly sensitive to customer demands and indicated that if customers had asked him to adopt the ANGCY, he would have given serious consideration to doing so. He also did not expect any stakeholders to overtly oppose adoption.

5.3.4.3 Factors that differed between adopters and the non-adopter

Thirdly, we provide an in-depth analysis of the factors that differed between adopters and the non-adopter. To be included in this list, the impact of the factor on adoption and implementation had to be similar in adopters and demonstrate an opposing, or no relationship in the non-adopter. The presence (in the case of facilitators) or absence (in the case of barriers) of these factors was therefore sufficient and may also be necessary for adoption and/or implementation of the ANGCY.

Adopters and the adoption process

Meaning of the ANGCY to managers: Individuals do not passively receive innovations, instead they engage with them in complex ways before coming to an adoption decision [27]. The adoption process essentially began when the personal values of recreational facility managers regarding the importance of supporting healthy eating in recreational facilities intersected with timely opportunities to do so. For the full adopter, this opportunity came in the form of the near simultaneous expiry of its 3 and 5 year food service contracts. For the semi-adopter, a suggestion from a member of the facility's governance Board provided the initial adoption stimulus. In both cases, managers, energized by their strong personal beliefs, took immediate action. They did not want to lose their window of opportunity to finally align their actions with their beliefs and to truly begin to "walk [their] talk." Congruence between the ANGCY and the personal philosophies of managers provided a strong foundation for maintenance of the original adoption decision despite the negative financial outcomes that ensued: "If they really want to eat junk food… they can just go to 7–11 and get it because for us, dollars and cents are not - that's not the motivating factor… [we] believe in what we're offering and if it's going to bring in less money, then so be it."

The non-adopter believed the ANGCY to be a good initiative but saw no need for them, erroneously believing his menu items to be healthy. In addition to the ANGCY having little meaning for this manager, the coincidence of events that encouraged adopters to act on their beliefs was not present in this case.

Attributes of the ANGCY

Complexity: Practices that are easily understood and communicated are more readily adopted [47]. Managers from adopter facilities described the recommendations and food rating system within the ANGCY as "practical, easy to understand, and user-friendly." The full adopter appreciated that "the guidelines [spoke] directly to recreation", and this allowed them to use wording "straight from the guidelines [in their contracts]." This simplicity facilitated policy development within short timelines. By contrast, simplicity was a quality lacking in the guidelines according to the non-adopter, who felt the 103 page ANGCY document was daunting.

Relative advantage: Relative advantage is the degree to which managers expect that following the ANGCY will confer advantages over previous practices. If potential adopters do not perceive a relative advantage they will often not consider an innovation further [27]. Managers within recreational facilities had to weigh the potential advantages to be gained from implementing the ANGCY against the negative consequences that might also result.

Food services within adopter facilities were overseen by the facilities' general managers. These managers had a wide scope of responsibility and placed a high priority on achieving the community wellness aspect of their mandate. They believed the ANGCY could assist them to support wellness. This potential advantage had to be balanced with the possible negative impact of the ANGCY on revenue generation from food services, however, as funding models were often at odds with support for healthy eating: "I think

it's just trying to balance what's sustainable in terms of support for the facilities because we get revenue or other assets from the sale of [unhealthy foods] at our facilities, and balancing our philosophy and our beliefs in terms of healthy lifestyles… We're on a teeter-totter… [we] can't do one without affecting the other one… like you start taking away the revenue and all of a sudden your fees go up and… so now you've got kids eating healthy but they're not going in to swim. We've got to balance it somehow." Therefore, in areas where ANGCY adoption had relatively small negative financial implications (ie. increasing the number of healthy items in concessions and vending machines), adoption proceeded. Conversely, in areas where ANGCY adoption came at a higher financial cost, the relative advantage of adopting the ANGCY was perceived to be low. For this reason, advertising and sponsorship agreements were maintained, and the sale of highly profitable unhealthy items continued (ie. the ANGCY were adopted in a choice-based format), even though managers would have personally preferred a restrictive format. Thus, the ANGCY offered a relative advantage to adopters insofar as they assisted them to achieve their wellness mandate in a financially sustainable manner. One manager found this a particularly troubling reality, and desired a new business model that did not make them dependent upon revenue from the sale of unhealthy foods.

Food services within non-adopter facilities were managed by a concession services manager with a narrow mandate of maintaining profitable food service operations. Thus, support for community wellness was relatively inconsequential for this manager, and he therefore perceived that adopting the ANGCY would put them at a competitive disadvantage. As a consequence, he had little interest in adopting them.

Organizational antecedents for the ANGCY

Professionalism: Professionalism refers to the professional knowledge of an organization's specialties, and is positively associated with organizational innovativeness [27]. Managers' knowledge of nutrition influenced whether they perceived a need to improve the food environment in their facilities by adopting the ANGCY. The manager of the non-adopter facilities believed that foods that were homemade, fresh, and 'real' were healthy. As such, he saw no need to adopt the ANGCY because he considered the hamburgers and hot dogs made with 100% beef, homemade soups, hot chocolate made with fresh milk and most of the other items available in his concessions to be healthy. In keeping with the ANGCY, managers from adopter facilities understood nutritional quality to be a function of the micro and macronutrient content of foods. On this basis, they recognized that the majority of the foods available in their facilities were not healthy.

Professional knowledge was also highly important for ANGCY implementation, as in all cases of successful implementation Registered Dietitians assisted industry to reformulate menu items and/or to identify items that met the definition of 'choose most often'.

Size of operation, technical capacity: Organizations that are larger, more mature, and that have greater technical resources tend to be more innovative [27]. Larger recreational facilities had a larger customer base and consequently their concessions had longer hours of operation. Their concessions also had more equipment, space for food storage and preparation and more highly skilled employees. These factors provided greater flexibility in their ability to prepare, store and sell healthier items and thus they could more easily adopt the ANGCY. Smaller concessions within single purpose facilities failed to adopt the ANGCY in part because they lacked this technical capacity.

Absorptive capacity for new knowledge: Recreational facilities that are able to identify and integrate new knowledge into their existing knowledge base will be better able to assimilate the ANGCY [27]. Prerequisites include the facility's pre-existing technical infrastructure, formal expertise, organizational know-how and interpersonal networks [48]. There was limited pre-existing capacity to implement the ANGCY within all facilities, and therefore adopters sought to leverage their existing food service partnerships with industry in a health promoting direction. Several of these food vendors had already developed capacity to implement the ANGCY in schools and were willing to transfer this learning to the recreational facility setting. Their willingness to adopt the ANGCY and to be responsible for implementation was an important facilitator: "What things made it easier? I guess just the simple fact that we didn't have to do any work… We didn't have to go out there and do research to find out how much of what is in what and how big and how is it made and how much salt… Thank goodness we didn't have to do that!"

By contrast, food vendors within the semi- and non-adopter facilities that did not agree to adopt the ANGCY either had no school-based operations, or were not using the ANGCY within their school-based operations. Thus, industry's use of the ANGCY in schools built transferable capacity for implementing the ANGCY in recreational facilities. When health promoting partnerships with industry were not present, ANGCY adoption and implementation did not occur.

Risk-taking climate: A risk-taking climate was present within all facilities, however managers differed on the type of risks they were willing to take. Adopters were willing to accept the small financial risk of implementing the ANGCY in a choice-based format, but not the much greater risks inherent in a restrictive format. Conversely, the non-adopter had little tolerance for experimentation with initiatives that were not specifically intended to improve profitability, such as the ANGCY: "Part of the problem that we have is that we are under a great deal of pressure to meet our budget – like a great deal of pressure. So to experiment with things, it has to be something that we know is going to do well and is not going to end up costing us money or add on staffing hours."

Managerial relations: Good relations between managers from recreational facilities and the food vendors operating within these facilities were present in all cases of ANGCY adoption. The juxtaposition of good and bad relationships within the semi-adopter was

instructive. A good relationship between the facility and the vending machine company was the means by which the barrier posed by the company's 20 year contract with the facility was overcome, whereas a poor relationship with one concession manager cemented this barrier in place and ultimately determined the status of the facility as a 'semi-adopter'. Similarly, the good working relationship between the semi-adopter and the vending machine company supported ongoing implementation of the ANGCY despite the decline in revenues that ensued.

Organizational readiness for the ANGCY

Fit of the ANGCY with the recreational facility context: The ANGCY are more likely to be assimilated if they fit the recreational facilities' existing values, norms, goals, skills, supporting technologies and ways of working [27]. Although nutrition was not a formal focus for the recreation sector, adopters sought to raise the priority of nutrition within their facilities by connecting the ANGCY to achievement of their organizational goals of supporting healthy lifestyles in the community. Because food services within non-adopter facilities were managed separately from the full facilities, they did not share the facilities' overarching wellness goals and the priority of nutrition remained low. The ANGCY were a poor fit within this context.

Tension for change: For ANGCY adoption to occur, recreational facilities must perceive that their current food provision is not ideal, that the ANGCY can ameliorate the spread between their current and ideal food provision, and that change is an immediate imperative. The poor fit among adopters` personal beliefs, their organizational mandates and practices elevated tension for change and prompted organizational reform. By contrast, the manager for the non-adopter facilities was principally concerned with maintaining profitable food service operations, and perceived that ANGCY adoption might further compound existing financial stress.

Communication and influence

Champion: Champions are key individuals who are willing to throw their support behind an innovation and endeavor to overcome organizational indifference or resistance to a new idea [26]. Managers in adopter facilities 'championed' the ANGCY within their facilities. Their qualities as champions were particularly evident when they requested that food vendors remove some highly profitable, but unhealthy items from the premises and when they remained committed to implementation despite declining revenues. The non-adopter recognized that not having an influential leader to champion the ANGCY was a barrier to adoption.

Diffusion and dissemination of the ANGCY: The influences available to help spread the ANGCY lie on a continuum from pure diffusion in which spread is largely unplanned, informal, and peer-mediated, to active dissemination, in which planned, formal programs and strategies are enacted to accelerate spread [27]. Adopters became aware of the ANGCY through formal dissemination channels, although information distributed in this way did not reach the non-adopter. Formal dissemination did not, however, provide a sufficient stimulus for ANGCY adoption by adopters. Instead, managers were

motivated to seriously consider adoption when others within their social networks shared how they were using the ANGCY in schools, and encouraged them to do the same. No one had ever discussed ANGCY adoption with the non-adopter.

Outer context

Competitive environment: Competition was not a pressing issue for managers of adopter facilities. These facilities were the largest in their respective municipalities and there was little concern that patrons might frequent other facilities or bring in food from outside sources. Conversely, the opening of a new modern multiplex in the municipality where non-adopter facilities were located had the corollary effect of reducing facility and food service patronage. These competitive pressures created an uncertain environment that left little latitude for experimentation with menu items that might prove unprofitable, thereby discouraging ANGCY adoption.

Interorganizational norm-setting: The ANGCY are more likely to be adopted if a threshold proportion of organizations have adopted, or plan to adopt them [27]. According to managers, most patrons regarded recreational facilities as venues for unhealthy eating and therefore industry norms favored unhealthy options. Adopters were willing to contravene these norms. The non-adopter indicated that he would have been more likely to adopt the ANGCY if "it became common that it was just that's what facilities do… and if you went into a facility and they didn't have, you know, fresh fruit or fresh vegetables, it would be kind of like that's weird, sort of thing." Thus, the current environment in which unhealthy foods were the norm discouraged him from adopting the ANGCY.

5.3.4.4 Factors related to the implementation process

We conclude by describing factors related to the implementation process. These factors were similar among adopters, however comparison to non-adopter facilities was not possible because they had not implemented the ANGCY. We are therefore unable to judge to what extent these factors may have been sufficient and/or necessary for ANGCY implementation.

Managers perceived adoption as a simple matter, whereas they described implementation as much more challenging: "Adopting was as easy as writing a policy and now the work begins with trying to find people who are able to, you know, develop programming around that and really implement it properly." Adopters expressed frustration with the unfinished state of implementation and its apparent ineffectiveness. Healthy options had always been available, implementation of the ANGCY simply meant there were now more of them. Meanwhile, unhealthy foods continued to dominate the food landscape. Notably, it was the manager of the full adopter facility who expressed the strongest sentiment in this regard: "I really think that we've missed the mark with implementing… It's one thing to have it in paper and contracts but it's another thing to deliver it… It's disheartening to see what doesn't happen. Like, it's not as simple as writing a policy and people picking it up. It just doesn't work that way." Managers recognized that assimilation of the ANGCY within the

organization's systems and structures would take time: "Am I jumping up and down saying we did it? No, because there's more to do. But at this point in time, in the short-term, we can't see that changing. Maybe long-term… There's a lot more we can do in terms of integrating [nutrition] within our services and programs. So that will come with time."

Implementation ultimately depended on the leadership and direction of facility managers, and therefore when time limitations prevented them from focussing their attention on the ANGCY no progress was achieved: "Other priorities haven't let me focus any energy here in quite some time… It just sits on the back burner. And so I'd say I'm a huge barrier, if you're looking at barriers and facilitators… Nothing is actively happening… and there is no plan to do differently or roll out anything new." Because of these time limitations managers attempted to devolve most of the responsibility for implementation to food vendors. Managers trusted them to implement the ANGCY, and did not monitor their progress in a formal and systematic manner. Instead, they gauged the status of implementation based on their own periodic observations and anecdotal reports from customers: "Probably every couple of weeks as I'm walking through the halls, I take note of what's in there… but it's not a checklist. It's just, what do I see, what do I observe. If there's something that catches my eye that's kind of off, we'll address it." This lack of monitoring likely contributed to the ambivalence surrounding ANGCY implementation, as no one could be sure their efforts had been worthwhile.

5.3.4.5 Propositions

The analysis culminated in the development of 25 propositions, presented in Table 5.7.

5.3.4.6 Long-term follow up

Six to 18 months following completion of each case study all facilities confirmed that their adoption status was stable, and that no major nutrition-related changes had been made to their food services.

5.4 Discussion

5.4.1 Food environment quality

Collectively, findings suggest that the food environment in facilities that have adopted and implemented the ANGCY may not be superior to the food environment in facilities that have not adopted the ANGCY. Although adopters made changes to their food environment, these changes were not substantial and did not create truly healthy food environments. These results are consistent with the only other published study of the impact of government nutrition guidelines on the food environment in recreational facilities. That study documented a 19% improvement in facility environment assessment scores and in availability of 'choose most' and 'choose sometimes' items in vending machines which, although statistically significant, nevertheless meant that the average post-intervention facility environment score was only 59% and only 17% of vending items were 'choose most' [15]. That substantial voluntary change appears to be so difficult to achieve in recreational facility food services is perhaps unsurprising in light

of current funding models, which make facilities dependent on the sale of unhealthy foods.

The availability of 'choose most often' items was low within all of the facilities and was not consistently higher in adopter compared to non-adopter facilities. This outcome was partially a reflection of the low availability of such items in the marketplace, as for example, there are few 'choose most often' food items suitable for sale within unrefrigerated vending machines. Although < 20% of items overall were 'choose most often' in all facilities, ANGCY implementation and NEMS-R scores were often high, suggesting that policy makers and researchers should reconsider what constitutes a healthy food environment. Specific, high targets for the proportion of items that must fall within the 'choose most often' category (ideally 100%) would help to ensure that nutrition guidelines support healthy food environments.

5.4.2 Factors that influenced adoption and implementation of nutrition guidelines

This study systematically applied a Diffusion of Innovations framework to better understand adoption and implementation of nutrition guidelines in recreational facilities in Alberta. We assumed causal complexity, that is, that there are multiple paths to adoption, and thus we used a set theoretic approach to discern 3 sets of factors [43]: 1) Factors that were common to all cases and were therefore not sufficient to compel or dissuade adoption and implementation of nutrition guidelines. 2) Factors that were unique to individual cases and not consistently associated with adoption and implementation. These factors may be influential in particular contexts. 3) Factors that distinguished adopters from the non-adopter, and were therefore sufficient and perhaps also necessary for adoption and implementation. The specific paths by which adoption and implementation may occur are not known, however, as many different combinations of these factors are possible [49]. In addition, it would be premature to discard factors within the first category as unimportant, as although they do not guarantee adoption and implementation, they may nevertheless prove essential in future studies [43]. Our analysis suggests that it is primarily factors within the third and perhaps also the second categories that determine whether or not adoption and implementation of nutrition guidelines will occur within a given context.

Although the specific adoption trajectories differed among cases, several important findings emerged. First, the keys to adoption and implementation relate to the manager. The manager is a reflective decision-maker whose beliefs, perceptions, and knowledge shape his decisions and actions. Adoption and implementation of nutrition guidelines in recreational facilities is more likely when the manager personally values healthy eating, has a broad scope of responsibility encompassing wellness, regards nutrition guidelines in a positive light, perceives a high tension for health-related change within his facility's food environment, is willing to champion changes that contravene industry norms and that may be financially risky, perceives few competitive pressures, maintains good relations with industry, and is willing to partner with them to achieve desired outcomes.

The fact that adopters were willing to eschew industry norms and adopt the ANGCY despite potential negative repercussions marks them as innovators [50]. These individuals are critical to diffusion as they act as gatekeepers, importing new ideas into a system [26]. Managers, however, do not have free reign. Their decisions are made within a particular micro and macroenvironmental context that is a source of facilitators and barriers. Barriers, including poor managerial relations, financial constraints, limited capacity to implement nutrition guidelines, unfavorable power balances, and the provisions of food service contracts impeded action on the part of managers. Financial constraints in particular, were a strong and consistent barrier to adopting and implementing the ANGCY in all facilities, as sales reductions caused managers to question the degree to which the ANGCY would provide them with an advantage relative to their previous practices. We were unable to objectively verify whether offering healthier foods was profitable in this context, and evidence from other studies in recreational facilities [15,24,51] and schools is conflicting [52-60] in this respect.

The challenge to balance support for affordable opportunities to be physically active with the need to promote healthy dietary behaviors is considerable in recreational facilities. Managers perceived that adopting the ANGCY in a choice-based format helped them to balance these competing priorities. Simply adding more healthy options to existing, largely unhealthy menus may not influence children's dietary behaviors, however, as exhibited by students' purchases in the full adopter facility. When given a choice, children tend to select unhealthy items [60-67]. Parents too, at times may make poor nutritional choices for their children because powerful social factors, time [68] and informational constraints [69] can easily take precedence over longer-term, intangible health concerns. Providing individuals with both healthy and unhealthy options (ie. a choice-based format) and trusting them to choose the healthiest option in spite of environmental conditions that overwhelmingly promote the opposite is unlikely to curtail escalating obesity rates.

The second major finding that emerged from this study is that although managers played a major role in adopting and implementing nutrition guidelines, they could not accomplish these tasks alone. Intersectoral linkages and formal health promoting partnerships were essential. Multi-sectoral, health promoting partnerships have long been recognized as a fundamental ingredient in effective health promotion practice [70]. It is difficult to envision how effective solutions to obesity can be forged without active involvement from the corporations that control and shape the food supply [71]. In the context of implementation of voluntary nutrition guidelines, adopters recognized that they lacked capacity to implement the ANGCY and therefore requested assistance from industry, leveraging their existing collaborative relationships in a new, health promoting direction. Where health promoting public-private partnerships existed, adoption and implementation proceeded, whereas no action was taken in their absence. The sustainability of these partnerships is unclear, however.

In addition to formal partnerships, informal linkages with schools were important. Adopters were motivated to seriously consider adopting the ANGCY when others within

their social networks shared how they were using the ANGCY in schools, and encouraged them to do the same. Diffusion of the ANGCY therefore occurred within municipalities, from schools to recreational facilities, rather than among recreational facilities, as adoption of the ANGCY was too low for diffusion networks to become activated in this context [16]. In addition, industry's willingness to collaborate with recreational facilities was partially determined by their pre-existing capacity to implement the ANGCY, developed through their school-based operations. Thus, efforts to improve the school food environment provided a supportive context and capacity to implement similar measures in recreational facilities.

Voluntary initiatives such as the ANGCY are of limited effectiveness in counteracting the pervasive influence of macro-level forces within the food system, as the environmental supports for voluntary action are poor. ANGCY uptake may therefore continue to falter under the current voluntary approach, and where it does occur, our findings suggest changes to the food environment may be relatively minor. Stronger government action is required to promote healthy dietary behaviors among children. Such action could include relatively less coercive (eg. incentives) or more coercive measures (eg. regulation). First and foremost, funding models should not be antithetical to recreational facilities' wellness mandates. Facilities derived a small percentage of their overall revenues from food services and sponsorships, and thus it would not be costly to replace this revenue. Next, the ANGCY should be revised to include specific, measurable and robust recommendations. Other actions could include financial incentives (eg. tax breaks) for industry to develop products that meet the definition of 'choose most often' and for those corporations that succeed in selling, not simply offering, a high proportion of 'choose most often' items. Similar to pay-for-performance schemes in health care, governments could incorporate guideline-related outcomes as performance accountabilities for recreational facilities to continue to receive a portion of their public funding. Finally, governments could simply mandate that all recreational facilities adhere to the ANGCY, ideally in a restrictive format. Although some may argue that such measures interfere with the individual's right to choose, many current policies already constrain food choice within recreational facilities (eg. funding models that make facilities partially dependent on food service revenues) and therefore such measures would merely counter existing obesogenic policies. These findings illustrate the tension that exists among individual rights, profitability and public health within market-based economies, and will assist policy makers to formulate policies that balance these competing interests.

5.4.3 Strengths and limitations

This study was unique and had many strengths, including its in-depth nature and the range of cases studied. Mixed methods provided a more comprehensive understanding of the research questions than could have been achieved with a single approach. Multiple quantitative and qualitative perspectives of the food environment highlighted the many ways in which the food environment can be conceptualized, and showed that using a single tool is likely to yield incomplete and biased findings. We used a novel theoretical framework to discern factors that influenced uptake of the ANGCY, a model

that may now provide a theoretical platform from which to investigate the uptake and operationalization of a variety of obesity prevention policies. Finally, we contacted facilities 6–18 months following each case study to ascertain whether their adoption status had changed, and whether they had made any nutrition-related changes to food services.

ANGCY implementation scores were not consistently higher among adopters, and indeed, were high in some non-adopter facilities. This result was consistent with adopters' perceptions that the food environment did not change substantially following ANGCY implementation. These results may also suggest a problem with the scoring system, as although the tool was judged to have good content validity, its construct validity may be poor. It is possible that the tool is not sensitive enough to differences between adopter and non-adopter facilities, as facilities could only receive a score of 0, 1 or 2 for each item. Others, however, have used similar scoring systems with good results [40]. Alternatively, the inability of the scoring system to distinguish adopter from non-adopter facilities may reflect problems within the ANGCY themselves, as informants felt several ANGCY recommendations were simply good business practice and likely to be practiced in all facilities. The guidelines also lack specific, measurable targets, which made it difficult to judge the degree to which facilities had implemented the recommendations. All of these factors likely contributed to the poor performance of the scoring system, however we believe the latter two were particularly influential.

We used multiple, mixed tools to assess food environment quality, however even these tools could not fully capture its many dimensions. We focused mainly on physical aspects of the micro food environment, and did not extensively investigate its political, sociocultural and economic aspects [72], nor did we capture the subjective perceptions of patrons. Because we assessed the food environment at a single time point we could only infer change in food environment quality from managers' comments and from comparison of adopter and non-adopter facilities. There is no universally agreed upon definition of a healthy food, and it is likely that a higher percentage of items would have been classified as healthy (ie. 'choose most often') using different standards, as ANGCY standards for sodium, in particular, are very stringent.

We make no claim that cases in this study are representative of all recreational facilities in Alberta. However, we have highlighted broad areas to target for change and provided as much detail as possible to allow the reader to evaluate the opportunities for generalization to other contexts.

5.5 Conclusions

This study investigated factors influencing uptake of nutrition guidelines in recreational facilities in a real world context. Findings showed that when a voluntary system is in place, the keys to adoption and implementation of nutrition guidelines in recreational facilities relate to the manager's nutrition-related knowledge, beliefs and perceptions, as these shape his decisions and actions. Policy dissemination strategies could therefore target these areas. The manager, however, cannot accomplish adoption and

implementation alone. Intersectoral linkages with schools and formal health promoting partnerships with industry were also important for adoption and implementation to occur. Voluntary action and meaningful gains may, however, not be realized in an environment of long-term food service contracts, limited support for change, funding models that depend on selling unhealthy food for profit, and relatively few palatable healthy products to substitute. Stronger nutrition guidelines and government support for product innovation may be needed.

Providing easy access to foods of poor nutritional quality in order to finance other social goods and preserve profitability is at odds with society's ethical obligations to provide benefit and avoid harm to children [73]. Although some recreational facilities may argue that they cannot afford to lose revenue by implementing nutrition guidelines, the health and financial costs of not doing so may be much higher. Data from this study contribute to a better understanding of the factors that are maintaining many recreational facility food environments in an obesogenic state, and of the levers that can be used to tip them in more healthful directions.

5.6 Tables

Table 5.1 Major components of Greenhalgh et al's conceptual model for considering the determinants of diffusion, dissemination and implementation of innovations in organizations

Framework components	Description	Examples
Attributes of the innovation	Perceived attributes of the innovation explain much of the variance in adoption rates	Relative advantage, complexity, observability
Organizational antecedents for innovation	General features of the organization that make it more or less innovative	Receptive context for change, absorptive capacity
Organizational readiness for innovation	Readiness and/or willingness of the organization to adopt a particular innovation	Power balances, tension for change, innovation-system fit
Adopters and the adoption process	Influential aspects of adopters and of adoption as a process	Meaning of the innovation to potential adopters
Processes of assimilation	Organizations may move back and forth between initiation, development and implementation of the innovation	Complex, non-linear processes
Implementation process	Specific steps involved in putting a decision into practice	Effective management, feedback and monitoring
Communication and influence	Means of spreading the innovation	Champions, diffusion, dissemination
Outer context	External influences on the organization	Socio-political climate, environmental stability
Linkage between developers and users	Connections that facilitate movement of the innovation from developers to users	Effective knowledge transfer from developers to users

Source: Based on a systematic review of empirical research studies [27].

Table 5.2 Summary of cases

Case	Full adopter	Semi-adopter	Non-adopter
Facility type	Large modern multipurpose facility	Large modern multipurpose facility	Four small aging, single purpose facilities
Funding	Publicly funded	Publicly funded	Publicly funded
Food service management	General manager	General manager	Dedicated concession services manager
Food service: concession(s)	An international franchise that had adopted the ANGCY in schools and in the full adopter facility. Popular for its fries and poutine.	1) An international franchise that had adopted the ANGCY in schools and was willing to adopt them in the semi-adopter facility. The company had a healthy brand image. 2) A small local company that had no school-based operations and was not willing to adopt the ANGCY in the semi-adopter facility. Popular for its fries and poutine.	4 municipally-operated concessions that were not associated with schools and were not willing to adopt the ANGCY in non-adopter facilities. The study focused on concessions in 2 facilities: 1) Pool café popular for its sandwiches, wraps, and baked goods. 2) Arena concession with a fast-food style menu.
Food service: vending machines	12 machines serviced by a company that had adopted the ANGCY in schools and in the full adopter facility.	21 machines serviced by a company that had adopted the ANGCY in schools and in the semi-adopter facility.	3 machines serviced by a company that had not adopted the ANGCY in schools or in non-adopter facilities.
Relationship with schools	Shared a field with 2 high schools. Students came to the facility at lunch primarily to purchase the unhealthy items they could not purchase on their campuses.	No schools within close proximity.	High school students came to the pool café at lunch, presumably to avoid long line-ups and because they preferred the café-style menu to their school's cafeteria.
Clients	> 50% children[1]	> 50% children[1]	> 50% children[1]

ANGCY: Alberta Nutrition Guidelines for Children and Youth.
[1]Children are defined as < 18 years of age.

Table 5.3 Subjective and objective assessments of vending machine items

Case	Full adopter	Semi-adopter	Non-adopter
Adoption status	Adopter in vending machines	Adopter in vending machines	Non-adopter in vending machines
Food vending machines			
ANGCY implementation score	67% High	71% High	41% Moderate
Availability of CMO food items	2% Very limited	4%[1] Very limited	0% None
Nutrient content of food machine items	216 kcals, 42% fat, 54% CHO (13g sugar, 1g fibre), 6% protein, 198 mg sodium	155 kcals, 29% fat, 62% CHO (6g sugar, 2g fibre), 8% protein, 218 mg sodium	285 kcals, 35% fat, 60% CHO (22g sugar, 2g fibre), 3% protein, 277 mg sodium
Beverage vending machines			
ANGCY implementation score	85% Very high	85% Very high	83% Very high
Availability of CMO beverages	31% Limited	26% Limited	13% Very limited
Nutrient content of beverage machine items	126 kcals, 0% fat, 98% CHO (28g sugar, 0g fibre), 3% protein, 77 mg sodium	107 kcals, 0% fat, 100% CHO (28g sugar, 0g fibre), 0% protein, 130 mg sodium	138 kcals, 0% fat, 100% CHO (38g sugar, 0g fibre), 0% protein, 126 mg sodium
Managers' perceptions of the health of vending machine items	"Our requirement is [that] 25% [of vending items be healthy] and they meet that, but it doesn't move so it sits there and the other [unhealthy] stuff on top moves… I wish there was better options… to have stuff in there that is new and interesting and does sell."	"In terms of vending, there are healthier choices. I wouldn't say it's successful… [but] it's better than it was. .. Am I jumping up and down saying we did it? No, because there's more to do."	"I've actually never really told them what to put in the vending machines. I don't eat chips, I don't eat stuff like that, so I don't even think about it…We did mention to them that we would like some healthy [items]… but other than that… he's trying to maximize his sales for the stuff that the kids like."

Managers' perception of the proportion of items that are healthy	25%	25-30%	15%

ANGCY: Alberta Nutrition Guidelines for Children and Youth; CHO: carbohydrate; CMO: choose most often; kcals: calories.

[1]This facility had a much higher proportion of 'choose sometimes' food items in vending machines compared to others, at 77% of items. The proportion of 'choose sometimes' items in other vending machines did not exceed 8%.

Table 5.4 Subjective and objective assessments of the food environment in concessions

Case	Full adopter	Semi-adopter		Non-adopter	
Adoption status	Franchised concession: adopter	Franchised concession: non-adopter	Local concession: non-adopter	Pool café: non-adopter	Arena concession: non-adopter
Facility ANGCY adoption score	82% Very high	0% No formal policies		0% No formal policies	
ANGCY implementation score	75% High	66% High	69% High	75% High	47% Moderate
Availability of CMO items:					
Overall	16% Very limited	22% Limited	11% Very limited	17% Very limited	11% Very limited
Main dish and side items	*23%*	*32%*	*14%*	*12%*	*0%*
Snacks and desserts	*7%*	*0%*	*0%*	*10%*	*0%*
Beverages	*16%*	*20%*	*15%*	*40%*	*24%*
NEMS-R[1]	+28 Healthy food environment	Healthy food environment[2]	+ 12 Moderately healthy food environment	+ 18 Moderately healthy food environment	+ 3 Limited healthy aspects of food environment

Managers' perceptions of the concession food environment	"My preference would be that we don't have the poutine and the real unhealthy stuff here… I would like to [have] a different vendor… that doesn't even have a deep fryer."	"[We] didn't have to have a discussion with the [franchised concession]… They don't have any junk."	"We think it would be great if they had more of a deli sandwich approach, you know, fresher, more healthy, instead of the focus on the usual high fat [items]."	"I think that what we do is pretty healthy… I mean when we make our muffins and stuff, we always try to make like a healthier option. But then there's always the… kind of unhealthy option, sort of thing. But they're both there."	"We try to use 100% real beef and you know, we try to – we use a healthier oil and just things like that. I mean, I know that it's still junk food but it's kind of, it's the healthier junk food… People always think a hamburger's not healthy for you but…it's beef… it's got lettuce and tomato and cheese on it, you know? So it's a burger. But it's still got the protein…"
Managers' perception of the proportion of items that are healthy	Not available	100%	10%	90%	60%

ANGCY: Alberta Nutrition Guidelines for Children and Youth; CMO: choose most often; NEMS-R: Nutrition Environment Measures Survey in Restaurants.

[1]The range of possible scores was −27 to +63.

[2]Given the non-traditional menu in this concession, a modified NEMS-R was completed and the range of possible scores for this facility was −27 to + 51. This facility scored +30 using the modified NEMS-R, which corresponded with the 'healthy' quintile on a modified scale.

Table 5.5 Industry's perceptions of food service sales

Managers' quotations regarding sales	Full adopter	Semi-adopter	Non-adopter
Sales of healthy items compared to sales of less healthy items	"Whether we like it or not they don't want cucumbers with light organic dressing.. What sells is fries and poutine."	"French fries is what I sell the most."	"There's nobody in this business can make money [selling healthy foods]." "If you're offering the choices they're always going to go for the unhealthy choice."
Perceived impact of the ANGCY on sales	"It's devastating… Horrible, our sales have been reduced."	"Sales dropped 50%."	"If we went into a high school doing $100,000 a year in sales, you'd be lucky to see $20,000 [if we implemented the ANGCY]. And I've done it – in [another province] not here."

ANGCY: Alberta Nutrition Guidelines for Children and Youth.

Table 5.6 Factors from Greenhalgh et al's Diffusion of Innovations framework [27] **that were common across all cases**

Factor	Definition and theoretically predicted impact on adoption and implementation	Study findings	Influence on adoption and implementation as reported by managers
Attributes of the ANGCY			
Observability	If the benefits of the ANGCY are visible to potential adopters they will be adopted more easily [27].	Managers anticipated few visible positive outcomes from adoption: "There's variety. But a positive outcome, because we have variety, I couldn't tell you. Like it's not something that's a visual thing that I can tell you that I see". Negative outcomes were expected and were highly visible because sales decreased significantly and many children continued to purchase unhealthy items.	Barrier to adoption and caused adopters to limit the extent of implementation to avoid larger negative financial consequences.
Task Issues	Innovations that are relevant to the performance of the user's work, that improve task performance and are feasible to use are more readily adopted [27].	The recreation sector had not typically incorporated nutritional considerations within its programming and services, and thus managers perceived some incompatibilities between the ANGCY and staff tasks.	Barrier to adoption and implementation.

Trialability	Innovations that can be experimented with on a limited basis are more likely to be assimilated [27].	All managers perceived that that they could "test drive" the ANGCY: "I would say we wrote the policy knowing that we would be trying to change it, based on how things went with our contracts. That was sort of the test, I guess, is measuring over the 3 years whether it was feasible to have them, whether there was public acceptance or backlash."	Facilitator of adoption.
Adaptability	Diffusion research suggests that innovations are not fixed entities and that innovations will be adopted more readily if potential adopters can modify them to suit their own needs [27].	All managers felt free to adapt the ANGCY and recognized that they could implement them to a greater (ie. restrictive format) or lesser extent (ie. choice-based format) to suit their own needs. This perceived flexibility was important as managers attempted to balance competing priorities of a health and financial nature.	Facilitator of adoption and implementation.
Augmentation	Innovations are more easily assimilated if training and support are provided to staff [27].	The Alberta government did not provide training nor did recreational facilities train their staff to implement the ANGCY.	No impact on adoption or implementation.
Organizational antecedents for the ANGCY			
Centralization	Extent to which decision making authority is concentrated or dispersed within an organization [45]. Negatively associated with organizational innovativeness [45].	Centralized decision making was present in all facilities.	Facilitator and barrier to adoption. It was not the hierarchical structure *per se*, but the priorities of those at the top of the hierarchy that mattered.

Managerial receptivity to change	Extent to which managers or members of dominant coalition favor change [45]. Positively associated with organizational innovativeness [45].	Adopters regarded the ANGCY as an opportunity for organizational growth. The manager of the non-adopter facilities also demonstrated a strong commitment to change in other areas.	Facilitator of adoption and implementation.
Slack resources	An organization's resources beyond minimal requirements to maintain operations [45]. Positively associated with organizational innovativeness [45].	Managers' and employees' time was fully occupied with their primary duties and responsibilities. Managers felt they had no spare resources to commit to ANGCY implementation.	Barrier to adoption and implementation.
Organizational readiness for the ANGCY			
Assessment of implications	Innovations are more likely to be assimilated if their implications are fully assessed and anticipated [27].	All managers recognized the potential for revenue loss. Adopters selected a choice-based format to limit negative financial repercussions. The non-adopter chose not to adopt the ANGCY for this reason.	Barrier to adoption.
Resource availability	Innovations are more likely to be assimilated if there is an adequate and continuing allocation of resources [27,29].	There were few tools available to support implementation. There was limited availability of ANGCY-compliant products in the marketplace.	Barrier to adoption and implementation.
Linkage			
Linkage at the adoption and implementation stage	Linkage agents can facilitate adoption of innovations by enhancing knowledge exchange between developers and users [46].	The provincial government hired Health Promotion Coordinators to support ANGCY adoption and implementation, however they did not have an influential role in any of the facilities in this study.	No impact on adoption or implementation.
Outer context			

Socio-political context	The organization's decision to adopt an innovation and efforts to implement it may be influenced by social norms and prevailing political ideologies.	Managers all believed to varying extents that it was up to individuals to "develop some personal choice skills where they [make] personal choices that are good for them." While adopters felt their role was "to make sure that [patrons] have those healthy choices in our facilities and hope that they help themselves", the non-adopter did not think it feasible to make healthy options available in all contexts.	The personal responsibility ethic was a barrier to adoption for the non-adopter and shaped how adopters implemented the ANGCY (ie. it was a barrier to a restrictive format).

ANGCY: Alberta Nutrition Guidelines for Children and Youth.

Table 5.7 Propositions regarding factors from Greenhalgh et al's Diffusion of Innovations framework [27] **that were not common across all cases**

Theoretical domain	Proposition
Food environment analysis	Profit-oriented food services are incompatible with healthy environmental defaults (ie. > 50% CMO items), regardless of whether they are municipally or privately operated.
Sales analysis	Patrons insufficiently choose healthy options when the environmental defaults are unhealthy (ie. < 50% CMO items).
Adopters and the adoption process	
Meaning of the ANGCY to managers	1) Adoption and implementation of nutrition guidelines is greatest when the personal beliefs of managers, the organizational mandate and the aims of nutrition guidelines are all aligned. 2) The personal beliefs of managers are highly influential and may motivate adoption when a window of opportunity arises.
Attributes of the ANGCY	
Complexity	Guidelines that are easily understood may be more readily adopted.
Relative advantage	1) Profitability is the most important barrier to adopting nutrition guidelines because managers perceive that selling healthy foods is unprofitable. 2) A choice-based format may assist facilities to balance wellness and revenue concerns associated with nutrition guidelines, but may not support greater purchase of healthy items by patrons. 3) Nutrition guidelines are perceived to provide a relative advantage insofar as they assist recreational facilities to achieve their wellness mandate in a financially sustainable manner. Small financial losses may be accepted if implementation supports achievement of other important priorities.
Organizational antecedents for the ANGCY	
Formalization	Short-term food service agreements provide greater flexibility to address emerging priorities.
Professionalism	1) Managers who correctly perceive their food environment as unhealthy are more likely to adopt nutrition guidelines. 2) Registered Dietitians are a source of critical expertise to support implementation of nutrition guidelines.
Size of operation, technical capacity	Large recreational facilities may have greater technical capacity to implement the ANGCY.

Absorptive capacity for new knowledge	1) Use of nutrition guidelines in schools can create a favorable climate and increase capacity for adopting nutrition guidelines in other contexts. 2) Health promoting partnerships with industry can provide capacity to implement nutrition guidelines that recreational facilities lack.
Risk-taking climate	Tolerance for financial risk is essential for adoption and implementation of nutrition guidelines.
Managerial relations	Where private industry is present, adoption and implementation of nutrition guidelines requires their full cooperation. When industry is committed to implementation, the stipulations of policies and contracts may be less important.
Organizational readiness for the ANGCY	
Power balances	Choice-based nutrition policies are better accepted by most stakeholders and may therefore facilitate adoption of nutrition guidelines.
Fit of the ANGCY with the recreational facility context	When food service is managed as a separate entity and is not under the direct purview of the general manager, its goals may not support adoption of nutrition guidelines.
Tension for change	Adoption of nutrition guidelines is more likely when management perceives a high tension for health-related change.
Communication and influence	
Champion	Managers act as gatekeepers of the food environment, and therefore an influential manager must champion adoption and implementation of nutrition guidelines.
Diffusion and dissemination	Use of nutrition guidelines in schools may facilitate spread to other contexts where diffusion networks are not yet active.
Outer context	
Competitive environment	Facilities that perceive fewer competitive pressures may be more likely to adopt nutrition guidelines.
Interorganizational norm-setting	1) Early adopters must be willing to accept the risks inherent in contravening industry norms. 2) Diffusion of nutrition guidelines may be slow to occur because of the association of unhealthy foods with sport spectatorship.
Implementation process	The absence of clear goals and priorities for implementation and failure to monitor its progress can impede the implementation process.

ANGCY: Alberta Nutrition Guidelines for Children and Youth; CMO: choose most often.

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CHAPTER 6: Adopting and implementing nutrition guidelines in recreational facilities: Tensions between public health and corporate profitability

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6.1 Introduction

Recreational facilities are an important venue in which youth can engage in physical activities [1]. Many of these facilities also serve food through vending machines and/or concessions [2]. In Canada, food services within publicly funded recreational facilities are often delivered in partnership with the private sector. Recreational facilities provide the space and have input into food service activities through negotiated contracts, while the private sector delivers food services and returns a portion of revenues to facilities as commissions and/or leasing fees. Current partnerships exist primarily for the purpose of generating profit, and as such, the majority of items available for sale within recreational facilities tend to be highly profitable, energy-dense, nutrient-poor items [3-7]. Ready availability of unhealthy foods in recreational facilities and other sports venues may partially explain why a recent systematic review found that youth involved in sport consume more fast food, sugar sweetened beverages and calories, and have a similar weight status compared to nonparticipants [8]. Recommendations that children spend more time in recreational facilities to prevent obesity [9-11] may therefore be counterproductive if children consume snacks and meals in this setting.

To increase children's access to healthy foods and beverages within recreational facilities, the Alberta government released the Alberta Nutrition Guidelines for Children and Youth (ANGCY) in 2008. These voluntary guidelines categorize food and beverages according to their nutrient content as 'choose most often' (consume daily), 'choose sometimes' (≤ 3 servings/week), and 'choose least often' (≤ 1 serving/week) and recommend that healthier options be available at all times, and fresh, convenient, visible and attractively packaged and priced [12]. Evidence suggests, however, that few recreational facilities are using them [5].

Recently, we described factors underlying the low uptake of the ANGCY from the perspective of recreational facility managers [13]. Greater clarity regarding the barriers faced by industry in implementing voluntary nutrition guidelines is also essential, as little is known about how public entities can partner with industry to achieve public health goals. We investigated the food service industry's perspective of factors that influenced their adoption and implementation of the ANGCY in recreational facilities to inform development of coherent, feasible obesity prevention policies that balance public health and corporate interests.

6.2 Methods

6.2.1 Study design

6.2.1.1 Theoretical framework

Greenhalgh et al's [14] diffusion of innovations framework models the transfer of complex process-based innovations in organizations (Table 6.1). The model provided an ideal theoretical platform from which to investigate the factors influencing uptake of the ANGCY within the food industry.

6.2.1.2 Ethical approval

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Human Research Ethics Board at the University of Alberta. Written informed consent was obtained from all subjects.

6.2.2 Data generation

Data generation and analysis were concurrent to permit exploration of emerging themes and adjustment of data gathering instruments and procedures. We define adoption as a one-time mental decision to follow the ANGCY, whereas implementation refers to multiple acts that must be repeated over time to put the decision into practice [15]. Consistent with Diffusion of Innovations terminology [15], we refer to companies and managers in terms of their adoption status as adopters and non-adopters.

6.2.2.1 Participant selection

This study occurred within the context of a multiple case study of factors influencing adoption and implementation of the ANGCY in publicly funded recreational facilities [13], defined as buildings where community members can engage in sporting activities. Cases for the multiple case study were purposefully selected and included a full adopter (1 facility that had adopted the ANGCY in its concession and vending machines), a semi-adopter (1 facility that had adopted the ANGCY in its vending machines, but not in its concessions) and a non-adopter of the ANGCY (2 facilities that were managed by a single manager and that had not adopted the ANGCY in their vending machines or concessions). Each case included multiple food service organizations and managers. All 6 privately-operated, for-profit food service companies present within the 3 cases agreed to participate.

6.2.2.2 Interviews

The theoretical framework guided development of a semi-structured interview guide which was pilot tested with 2 managers and subsequently revised. Seven managers were interviewed, including 4 from companies that had adopted and implemented the ANGCY (adopters, 2 from the same company) and 2 from companies that had not (non-adopters). The seventh manager was from a company that had adopted and implemented the ANGCY in schools and was willing to, but had not yet adopted them in their recreational facility-based operations. Collectively, these managers represented all of the known food service organizations that had adopted and implemented the ANGCY

within Alberta's recreational facilities. We were informed that there may have been another industry adopter, however we were unable to confirm this information.

The same investigator interviewed each manager for 45-120 minutes, in-person on the company's premises (n=5) or by telephone (n=2). The investigator was knowledgeable of the context, as she performed the in-depth case studies of which this study was a part. Informants were reminded to comment from the perspective of the organization. General questions were initially asked to open up each area of inquiry, followed by targeted probes to query the specific influence of factors within the theoretical framework. Interviews were digitally recorded and transcribed verbatim.

6.2.3 Data analysis

Interview data were analysed according to principles of directed content analysis [16]. Using this approach, the theoretical framework guided development of an initial coding and categorizing scheme and operational definitions for the codes [16]. Another member of the research team inspected the coding scheme to ensure congruence with the elements of the theoretical framework. A single investigator applied the identical coding and categorizing scheme to all study data using techniques of memoing, constant comparison and questions. NVivo software (v.9, QSR International, Cambridge, MA) was used to organize the data during analysis. An audit trail documented the sequential steps that were followed and the reasoning behind analytical decisions.

6.2.4 Rigour

Data trustworthiness was ensured by interviewing all known adopters of the ANGCY, interviewing both adopters and non-adopters, pre-testing of the interview guide, application of a robust theoretical framework during data generation, analysis and interpretation, peer checking of the coding scheme, having all data coded by the same person, collecting and analyzing data concurrently, maintaining an audit trail, data triangulation and prolonged engagement in the setting.

6.3 Results

6.3.1 Context

Table 6.2 presents selected characteristics of companies included in the study.

6.3.2 Factors that influenced adoption and implementation of the ANGCY (Table 6.3)

Themes are presented within 6 domains of the theoretical framework, followed by representative quotes reflecting dominant participant responses.

1) Attributes of the ANGCY

Complexity: *"I can't just… read labels all day."*

Non-adopters did not perceive the ANGCY to be complex. By contrast, as those who had actually had to implement them, adopters expressed frustration with the complexity of the ANGCY's food rating system. It was difficult and time consuming to find and source foods that met the ANGCY definition of 'choose most often', especially

those that would also appeal to consumers: "I just wish it was cut and dry and tell us – tell us what products we can put in it, you know? But right now I've got to go read every package and try and match it up. And I've got other things to do, you know? I can't just sit there and read labels all day... If they told me what I could put in, then it would be easier." Companies sought the expertise of registered dietitians to assist them, however dietitians too, found aspects of the ANGCY challenging to work with.

Observability: *"Sales dropped 50%."*
Adopters experienced highly visible negative financial outcomes following ANGCY implementation, including reduced revenues, which for two adopters led to downsizing and staff layoffs (Table 6.2). These visible negative consequences discouraged further implementation of the ANGCY, although they did not cause adopters to rescind their original adoption decision. Managers indicated that they had not seen any positive outcomes from ANGCY implementation.

Augmentation: *"[We have a dietitian who determines] how… to adapt these recipes to have the nutrition work out."*
The government did not provide training and therefore potential adopters faced the barrier of having to determine how to implement the ANGCY on their own. Large franchises had registered dietitians working for them who could undertake this work, however smaller organizations did not.

Compatibility: *"I'll be quite honest, the bag tastes better than the [baked] chips do."*
One of the most important barriers to use of the ANGCY was that ANGCY standards were not compatible with products available in the marketplace, with consumer taste preferences, or with the prices consumers were willing to pay. First, managers could not locate many 'choose most often' food items suitable for sale within unrefrigerated vending machines, and ANGCY sodium standards were so low that it took 1 franchise several months to find a suitable lean deli meat for use in menu items:"…the biggest disconnect is, we've got the regulations, but no availability of those ingredients." Of even greater concern, however, was that no matter how many new 'choose most often' products some adopters introduced, their sales remained low because these items did not meet consumer taste expectations.

Relative advantage: *"At the end of the day, I've got to make some money."*
Relative advantage is the degree to which managers expect that following the ANGCY will confer advantages over previous practices. If potential adopters do not perceive a relative advantage they will often not consider an innovation further [14]. Profitability was the bottom line for industry. It was not as important what customers purchased, be it healthy or unhealthy, only that they purchased something. High sales volumes and profit margins on unhealthy items made their sale particularly advantageous, and therefore these items constituted the majority of items offered by adopters and non-adopters alike. Non-adopters therefore perceived no net advantages to adhering to the ANGCY: "We won't even bid on a piece of business that wants [to use the ANGCY] because we can't make money. There's nobody in this business can make money with

it." Adopters similarly perceived the ANGCY would not benefit them financially in the short-term, but nevertheless agreed to implement them because they believed there was potential for long-term gain through positioning themselves at the forefront of the growing market for healthier items. Thus, they tolerated short-term risk in anticipation of long-term gain. A clear relative advantage was only apparent for 1 company for whom ANGCY adoption was consistent with their successful brand image as a provider of healthier options.

2) Adopters and the adoption process

Meaning of the ANGCY to managers: *"I would way sooner sell a healthier product than an unhealthy product, but I'm still a business guy right?"*
Adopters felt healthy eating was important and wanted to support it. These personal beliefs did not, however, provide a sufficiently compelling motive for adoption, as non-adopters expressed similar sentiments.

3) Organizational antecedents for the ANGCY

Technical capacity: *"If you want 60% 'choose most often' into a vending machine, I have to have a refrigerated vending machine. So now my cost doubles for the investment."*
The high cost of refrigerated vending machines was a barrier to offering healthier options in vending machines. Technical capacity was, however, not perceived to be a barrier in concessions: "I can't say equipment is an issue. Like I don't think anybody could use that excuse. Like really, is it hard to pump out more salad than fries? Probably not. It's probably easier, actually. You could pre-make the salad and just throw them into containers, right?"

Centralization: *"It would have been a lot easier to have Canada-wide [standards]."*
The lack of a single, national nutrition standard was an important barrier to implementation of the ANGCY for franchised operations, which had to simultaneously comply with several different provincial standards.

Absorptive capacity for new knowledge: *"Well this is what we do in schools… we could try it here too."*
Uptake of the ANGCY in recreational facilities was facilitated by the knowledge, skills and experience that adopters had acquired through implementing the ANGCY in schools. By contrast, non-adopters either had no school-based operations or were not using the ANGCY within their school-based operations.

4) **Linkage:** *"At the end of the day, someone high up [made the] decision."*
Linkage refers to the mechanisms for knowledge exchange between the Alberta government and recreational facilities. Some adopters were frustrated that the government seemed not to have considered industry's perspective when formulating the ANGCY. In addition, those hired to support implementation did not always have the familiarity with their issues to provide meaningful support.

5) Organizational readiness for the ANGCY

Power balances: *"I've got to be able to sell items in that machine that [customers] actually want to buy."*
The products offered by industry reflected the fact that patrons, through market forces, held the balance of power within these organizations. Managers were clear: "It's all based on demand. What people are eating and what people are buying is going to support what [is being sold]. It's basic economics." Non-adopters acceded to market forces, selling the unhealthy items that patrons demanded. Adopters, by contrast, struggled against market forces, providing healthier options despite low demand because they were trying to adhere to the ANGCY.

Managers also considered recreational facility managers to be an important constituency. As such, all food vendors who were asked to adopt the ANGCY by recreational facility managers agreed to do so, and indicated feeling forced to consent to this request. By contrast, a specific adoption request was never made of non-adopters.

Assessment of implications: *"We used to pay for all the scoreboards,... sports programs, basketballs, everything was coming… out of the sales of [unhealthy foods] so the kids could get exercise."*
Managers were united in their expectation of negative financial outcomes following ANGCY implementation, however adopters felt that negative impacts would be short-lived. Some managers acknowledged that small improvements in children's dietary behaviors might also be achieved from ANGCY implementation. Their overall health impact was expected to be neutral, however, because profits from the sale of unhealthy foods would no longer be available to finance activities and infrastructure within recreational facilities, thereby reducing children's opportunities to be physically active.

6) Outer context

Socio-political context: *"Educate, don't eliminate."*
Managers indicated that patrons expected to be free to choose to consume unhealthy foods within recreational facilities, as it was part of the culture of sport spectatorship and of wider social norms: "People are wanting healthier choices. But that's the whole thing. They still want a choice. They still want the junk, you know?" Industry, in turn, expected to be free to provide the unhealthy items that customers demanded, believing that the market should dictate product availability and that parents and schools should teach children to make healthy choices. Thus, the personal responsibility ethic was strongly held and deterred ANGCY adoption.

Managers recognized that implementing the ANGCY in recreational facilities would not create a culture of health within society, and that more comprehensive measures would be needed: "The vending industry is such a small little niche that it's irrelevant in terms of the scope of the big picture… it has to be a societal change…They're not going to start eating healthy 'cause it's in the vending machine." However, in calling for more comprehensive measures, managers also attempted to deflect responsibility onto other sectors, using this as an excuse for inaction, or only limited action, on their part.

Competitive environment: *"They are just going to go across the street."*
Managers felt very susceptible to competitive pressures and were concerned that the ANGCY targeted a small number of sectors. If they could not sell the items their customers demanded, then patrons would simply purchase unhealthy items elsewhere. One manager questioned: "Should I… just be the good guy and other [restaurants] are just allowed to flourish and make their sales?... If they're not doing it, why should I?" The problem was particularly salient for 1 vending machine company that had implemented the ANGCY in a facility where the concessions had not.

Interorganizational norm-setting: *"If they're not doing it, why should I?"*
Adopters stood out as those who were willing to contravene industry norms to remain on the leading edge. These managers led the way by offering healthier options in sectors dominated by the sale of unhealthy food. Non-adopters, fearing loss of profits, preferred to conform to prevailing industry norms by offering primarily unhealthy items.

Incentives and mandates: *"It has to be mandated... It can't be voluntary. There's no way it'll work."*
Most managers agreed that government-mandated adherence to the ANGCY was the only feasible means of achieving widespread adoption in recreational facilities, as voluntary adoption was not in their financial interests. A financial subsidy to compensate for losses incurred by following them was also deemed essential by some. Ideally, managers felt adherence should be mandatory for the entire food service sector, or at minimum for those businesses located within close proximity to recreational facilities. Nevertheless, although managers thought government regulation would be effective, they were reluctant to fully support such measures due to interference with personal and corporate autonomy.

6.4 Discussion

Multi-sectoral partnerships are essential to effective health promotion practice because the determinants of health are so broad that no single sector can fully control them [17]. Health promoting public-private partnerships are uncommon, however, as many perceive that the profit motive of the private sector is incompatible with public health goals. We interviewed managers from companies that had adopted the ANGCY to discern factors that compelled them to voluntarily adopt nutrition guidelines, and compared this perspective with that of non-adopters. Findings revealed that public-private partnerships can embrace public health goals in the short-term, provided that industry perceives a potential for long-term financial gain. Our results provided the basis for constructing a typology of adopters and non-adopters. Non-adopters maintained a strong focus on short-term profitability. They focused on immediate, visible outcomes, had a low tolerance for risk, and preferred to conform to industry norms. They were somewhat pessimistic in their evaluation of innovations. Adopters, on the other hand, were innovators. They took a long-term view of profitability and were willing to take small risks, sacrificing short-term profitability to remain on the leading edge of market trends.

Adopting and implementing nutrition guidelines were not easy for adopters, however. They lacked resources and training, found the guidelines complex, had difficulty locating suitable products, had to act in opposition to market forces, felt squeezed by competitive pressures, and experienced highly visible reductions in revenue that threatened the viability of their businesses. Despite these barriers, adopters continued to implement the ANGCY, primarily because they felt forced to do so by recreational facility managers, and also because they perceived that remaining ahead of healthy eating trends offered potential for long-term financial gain. Similar barriers and motivations for transitioning to healthier products in response to nutrition guidelines were expressed by representatives from British Columbia's food industry [18].

Our findings that industry views nutrition guidelines through the lens of profitability can inform strategies to enlist industry's cooperation in public health initiatives. While moral responsibility and improving community health may provide sufficient motivation for the public sector to engage in health promotion initiatives, these rationales are less compelling for industry, which exists primarily to generate profit [19]. Managers in our study failed to recognize, however, that escalating rates of chronic disease are one of the greatest threats to the global economy [20, 21], to the health of workers and consumers, and by extension to industry. The challenge to stimulate uptake of nutrition guidelines, then, is to make the business case that support for chronic disease prevention will improve corporate profitability through access to a healthy workforce and clientele, and a productive economic climate [21].

Governments have often relied on the food industry to act voluntarily in the public interest to avoid interfering with market mechanisms [22, 23]. Voluntary industry guidelines have proven relatively ineffective in ensuring responsible practices by the food industry [24-27], however, as adherence places companies at a competitive disadvantage if their competitors do not also comply. Our findings in Alberta's recreational facilities suggest a similar conclusion, as few companies appeared to be using the ANGCY in their recreational facility-based operations. Increased uptake in the future may be unlikely, as non-adopters perceived no net benefit to them of adopting the ANGCY and adopters could not point to any positive outcomes of adoption. Notably, however, one company stood out as one that, by virtue of its successful healthy brand image, actively sought to adhere to the ANGCY, proving that private industry can behave in ways that are both socially and fiscally responsible. Thus, voluntary, fruitful partnerships may be formed with companies that are committed to producing healthier food [28].

All managers maintained that widespread voluntary adoption of the ANGCY was unlikely without significant government incentives and/or a mandate, as the environmental context for voluntary action was poor. Although industry typically opposes government regulation [29], managers in our study favored it. Requiring all food service companies, or at minimum all of those within close proximity to recreational facilities to adhere to the ANGCY was seen as a means to level the playing field upon which all companies

compete. Legislation may therefore be an important, and not unwelcome tool in stimulating adherence to nutrition guidelines. This was also the case in the United States with federal menu labelling legislation, which industry supported because it provided a consistent national standard [30].

The absence of a single, national nutrition standard was an important barrier to compliance with nutrition guidelines for franchised companies, and also likely contributed to the difficulty in locating 'choose most often' items, as there is little incentive for industry to reformulate products to fit standards that differ by province. Limited availability of healthier options was also a barrier to implementing nutrition guidelines in recreational facilities [18] and schools [31] in other Canadian provinces. These findings underline the importance of collaboration between levels of government to develop national nutrition standards, and of ensuring public-private linkages at all stages, from guideline development to implementation. Governments, however, are often criticized for acceding to the demands of powerful industry lobby groups [32, 33], and therefore a balance must be maintained between what is feasible for industry and what is in the public interest.

6.4.1 Limitations

Although the sample size was small, we captured the perspectives of all of the companies known to have adopted the ANGCY at the time of the study. Furthermore, the same themes were repeated in all interviews. Congruence of our findings with the theoretical framework is important, as it can provide a basis for transferring findings to other cases. It was not possible to thoroughly examine all aspects of the theoretical framework within the limited timeframe allocated to interviews with managers, and therefore other factors might also be important. Future studies regarding factors within the linkage and communication and information domains would help to elucidate the role of individuals other than the manager, and of communication networks, in adoption of nutrition guidelines. Although we asked managers to comment from an organizational perspective, it is possible that other managers may have provided a different perspective. This study was undertaken in the Canadian context, however we believe that findings will be transferable to other nations with similar neo-liberal, market-based ideologies. It is not clear whether findings are relevant to contexts outside of the recreational facility setting, however informants indicated similar, and even more negative outcomes of adherence to nutrition guidelines in their school-based operations.

6.5 Conclusions

It is difficult to envision how effective solutions to obesity can be forged without active involvement from the corporations that control and shape the food supply [34]. The ANGCY represent an attempt to leverage existing collaborative relationships between the private and public sectors within recreational facilities in a new, health promoting direction. By partnering with industry, recreational facilities gained access to their food-related expertise, to their financial and material resources, and to the capacity they had built to implement the ANGCY in schools. Widespread uptake of voluntary nutrition

guidelines in this setting is unlikely, however, as market mechanisms do not encourage industry to sell and promote healthier options. Government legislation may therefore be warranted.

Financial profitability is desirable and essential within market-based economies. Nevertheless, providing easy access to foods of poor nutritional quality to preserve corporate profitability is inconsistent with society's ethical obligations to provide benefit and avoid harm to children [35]. Hancock has proposed a new form of capitalism that places human capital at the centre, and uses natural, social and economic capital in its service [36]. This model provides a useful heuristic for balancing public and private concerns, and predicts that successful businesses will be those that cultivate all 4 forms of capital simultaneously because they realize their success is predicated upon the health and productivity of their employees and clients, the social resources within their communities, and the sustainability of the environmental resources upon which they draw [36]. It also reminds the public sector that the economic capital generated by industry constitutes the means by which society finances its human and social goals. Each sector must be mindful of the other's constraints, such that respectful, trusting relationships are developed and maintained.

6.6 Tables

Table 6.1 Major components of Greenhalgh et al's conceptual model for considering the determinants of diffusion, dissemination and implementation of innovations in organizations

Framework components	Description	Examples
Attributes of the innovation	Perceived attributes of the innovation explain much of the variance in adoption rates	Relative advantage, complexity, observability
Organizational antecedents for innovation	General features of the organization that make it more or less innovative	Receptive context for change, absorptive capacity
Organizational readiness for innovation	Readiness and/or willingness of the organization to adopt a particular innovation	Power balances, tension for change, innovation-system fit
Adopters and the adoption process	Influential aspects of adopters and of adoption as a process	Meaning of the innovation to potential adopters
Processes of assimilation	Organizations may move back and forth between initiation, development and implementation of the innovation	Complex, non-linear processes
Implementation process	Specific steps involved in putting a decision into practice	Effective management, feedback and monitoring
Communication and influence	Means of spreading the innovation	Champions, diffusion, dissemination
Outer context	External influences on the organization	Socio-political climate, environmental stability
Linkage between developers and users	Connections that facilitate movement of the innovation from developers to users	Effective knowledge transfer from developers to users

Source: Based on a systematic review of empirical research studies [14].

Table 6.2 Selected characteristics of participating food service organizations

Company type	Concession	Concession	Concession	Vending machine	Vending machine	Vending machine
Manager(s) interviewed	1) District manager 2) Unit manager	Nutrition consultant	Owner and manager	Owner and manager	Vending supervisor	Vending supervisor
ANGCY adoption status in recreational facilities	Adopter	Non-adopter but willing to adopt	Non-adopter	Adopter	Adopter	Non-adopter
Scale of operations	International franchise	International franchise	Single site	Provincial	Municipal	Municipal
Brand image	Popular for its fries and poutine but also has a proprietary nutrition program.	Well established healthy brand image.	Popular for its fast-food style menu.	Known for its healthier snack food and beverage items.	Popular for its traditional snack food and beverage items.	Popular for its traditional snack food and beverage items.
Contractual obligations	Contractually obligated to implement the ANGCY.	None	None	None	Contractually obligated to implement the ANGCY.	None
Availability of healthy food items*	16%	24%	8%	4%†	2%	0%
Availability of healthy beverages*	16%	20%	15%	26%	31%	13%
Perceived sales of healthier compared to less healthy items	"Whether we like it or not they don't want cucumbers with light organic dressing… What sells	"I would say the majority [of the menu] is healthy."	"French fries is what I sell the most."	"I can't give a granola bar away… I'll dust them off every 2 weeks. The	"But no one buys [the healthier products], right? If they go to a machine and there's a choice between a [granola bar]	"There's nobody in this business can make money [selling healthy

	is fries and poutine."			regular chips… [and] the chocolate bars… sell."	and a [chocolate bar], they're going to take the [chocolate bar]."	foods]… If you're offering the choices they're always going to go for the unhealthy choice."
Reported decline in revenue post-ANGCY implementation[‡]	↓17%	N/A	N/A	↓50%	↓20%	N/A
Perceived impact of the ANGCY on profitability[§]	"It's devastating… Horrible, our sales have been reduced."	N/A	N/A	"I had 24 staff and 4 partners. There's 1 partner and 11 staff left."	"It's tough on business... We lost a full position so we had to fire someone."	N/A

ANGCY, Alberta Nutrition Guidelines for Children and Youth; N/A, not applicable.

[*]Availability of items that fit ANGCY criteria for 'choose most often' [12] in the recreational facility that participated in the multiple case study.

[†]This company had a much higher proportion of 'choose sometimes' food items compared to others, at 77% of items. The proportion of 'choose sometimes' items in other companies did not exceed 24%.

[‡]Although food vendors maintained that these reductions were primarily due to the ANGCY, it was not possible to verify this claim. Other possible explanations include the economic recession that was ongoing during the time of ANGCY implementation and reduced facility usage. Two concessions that had not adopted the ANGCY reported that their revenues declined by 5% and 9%, respectively, over the same time frame [13]. Managers attributed these declines to reduced facility usage.

[§]These comments reflect manager's perspectives of the combined outcomes of ANGCY implementation in recreational facilities and schools.

Table 6.3 Enabling and constraining factors to adopting and implementing the Alberta Nutrition Guidelines for Children and Youth by private industry in recreational facilities

Enabling factors	Theoretical domain*	Constraining factors
Relative advantage: Potential for long-term financial gain, financial advantage for one franchise with a successful healthy brand image	Attributes of the ANGCY	Complexity: Food rating system complex to use Observability: Highly visible negative outcomes, no visible positive outcomes Augmentation: No training provided Compatibility: ANGCY not compatible with product availability, consumer taste preferences or the prices consumers were willing to pay Relative advantage: Healthy items perceived as unprofitable
Meaning of the ANGCY: Managers personally supported healthy eating	Adopters and the adoption process	
Absorptive capacity for new knowledge: Previous experience implementing the ANGCY in schools	Organizational antecedents for the ANGCY Linkage	Technical capacity: High cost of refrigerated vending machines Centralization: lack of a single, national nutrition standard Design stage: Perception that the industry perspective was not adequately considered Implementation stage: Linkage agents not always familiar with industry concerns
Power balances: Adoption requests from recreational facility managers	Organizational readiness for the ANGCY	Power balances: Low market demand for healthier items Assessment of implications: Expectation of negative outcomes
Interorganizational norm-setting: Willingness to contravene industry norms to remain on the leading edge	Outer context	Socio-political context: Personal responsibility ethic, deflection of responsibility onto other sectors Competitive environment: Patrons could easily purchase unhealthy items elsewhere Interorganizational norm-setting: Fear of profit loss led to

	conformity with industry norms Incentives and mandates: ANGCY adoption was not mandatory, no financial incentives available for adopters

ANGCY, Alberta Nutrition Guidelines for Children and Youth.
*Based on Greenhalgh et al's Diffusion of Innovations framework [14].

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CHAPTER 7: The role of Registered Dietitians in health promotion

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7.1 Introduction

The medical model of health has shaped the professional practice of Registered Dietitians (RDs) in Canada and other nations, situating the majority in clinical counselling settings. This model posits that obesity, a condition for which RD expertise is frequently sought, is primarily a consequence of suboptimal individual lifestyle (diet and physical activity) behaviors [1]. The educational and behavioral strategies used by RDs and other health professionals in clinical settings have had limited success in containing or reversing the obesity epidemic, however, as evidenced by obesity trends [2]. Recent research confirms that environmental factors may be equally or more important than biological and behavioral factors in the pathogenesis of obesity [3], suggesting a need to address the underlying environmental conditions that drive individual behaviors. As such, the locus of obesity control is increasingly shifting from clinical settings into the communities where people live, work and play. A corresponding shift in the context in which RDs practice is emerging. In this paper we use our experience in assisting in the development of, and in evaluating the Alberta Nutrition Guidelines for Children and Youth (ANGCY) [4] as a basis to explore some of the roles that RDs can and do play within community health promotion, and how others perceive the RD role.

7.2 Methods

7.2.1 Context

In 2007 the authors were part of a team that developed a background literature review and draft guidelines for the ANGCY. The guidelines are a voluntary tool to assist schools, childcare and recreational facilities to facilitate children's access to healthier food and beverages [4]. One year following the release of the ANGCY we investigated their outcomes [5, 6]. Our experiences in contributing to the development of the guidelines and in investigating their outcomes in recreational facilities provided many opportunities to observe the role of RDs in the context of health promotion.

7.2.2 Ethical approval

Our investigation of the outcomes of the ANGCY received ethical approval from the Human Research Ethics Board at the University of Alberta. Informants provided written, informed consent prior to participating.

7.2.3 Data generation

Greenhalgh et al's Diffusion of Innovations model [7] was used as a theoretical framework to guide data generation, analysis and interpretation. Data were generated via interviews with key informants and through observations during the course of a multiple case study of recreational facilities that had and had not adopted the ANGCY

[5]. A more thorough description of methods used is available in the published multiple case study. Briefly, managers from recreational facilities (n=5 from 4 different facilities) and industry (n=7 from 6 different companies) participated in 1-2 semi-structured interviews with the first author lasting between 45 and 120 minutes. Development of the interview guide was informed by Diffusion of Innovations theory. Managers were asked to describe their experiences related to the ANGCY, including how they learned of them, why they did or did not adopt them, the steps they had to complete to implement them, what factors influenced their adoption and implementation of the ANGCY, and the outcomes they had observed from implementing them. Data generation and analysis were concurrent, and therefore following preliminary analyses a question was later added about support received from RDs. Two to three 30 minute observation periods, guided by a theoretically-informed observation guide, were conducted by 2 independent observers. We also draw on dialogue and personal observations that occurred while developing the ANGCY.

7.2.4 Data analysis

A single investigator applied a theoretically-informed coding and categorizing scheme to all study data according to the principles of directed content analysis [8], and using techniques of memoing, constant comparison and questions. NVivo software (v.9, QSR International, Cambridge, MA) was used to organize the data during analysis.

7.3 Results

7.3.1 Roles in guideline development

Following a competitive process, a RD and Professor of nutrition at the University of Alberta was contracted to write a background literature review and draft version of the ANGCY that was used to conduct a provincial stakeholder consultation. She assembled a team of faculty members and research assistants to complete the project, the majority of whom were RDs. Four of the 5 lead roles on the team were played by RDs. The Ministry of Health also put in place an ANGCY committee with representation from 6 provincial ministries and 2 federal organizations. The committee was chaired by a RD. After completion, the draft version of the guidelines underwent stakeholder review. RDs were consulted during this process and provided important formative feedback. The ANGCY committee along with a RD employed by the provincial government revised the draft guidelines according to recommendations received during the stakeholder consultation process. A team of scientists and RDs then created a food rating system to identify which items were considered healthy under the guidelines.

7.3.2 Roles in developing supportive tools

RDs working within government and community settings developed supportive tools for the ANGCY to assist the public in implementing them.

7.3.3 Roles in guideline adoption and implementation

Health Promotion Coordinators, several of whom were RDs, were hired to support implementation of the ANGCY. One of the Health Promotion Coordinators, a RD, assisted a recreational facility to select healthier food vendors and helped companies with recreational facility-based operations to use the ANGCY food rating system to

identify healthier items. RDs working within private practice and for industry helped industry to reformulate menu items, provided nutrition-related advice, and often led industry efforts to implement the ANGCY within their recreational facility-based operations. Indeed, in all cases of successful ANGCY implementation, managers described multiple supportive and/or leadership roles that RDs had played.

7.3.4 Perception of RDs

Recreational facility managers did not perceive that they required the support of RDs with ANGCY implementation because they had made industry responsible to implement the ANGCY. They also felt they could not afford to pay for RD support. Smaller companies had similar financial limitations, and either could not afford RD support or could only hire RDs for limited periods. RDs working within community settings were therefore the most accessible source of nutrition support for these companies. Large franchised companies, by contrast, were willing and able to pay for the ongoing services of RDs. These companies already had RDs working for them and clearly valued their expertise, as evidenced by the senior positions some RDs occupied and prompt implementation of their recommendations.

Overall, managers expressed favorable opinions of RDs, although a few had mixed opinions. Some felt that RDs did not understand industry because they recommended healthier products for which there was little customer demand. Other RDs who were more willing to consider both taste and nutrition were described by industry as individuals who "understand where I'm coming from." Differences of opinion among RDs led to some frustration, however, with one manager commenting that: "I've dealt with four or five different dietitians. They've all got a different idea on what's healthy and what's not healthy."

7.4 Discussion

While the role of RDs in clinical settings is generally well-defined and understood, relatively less is known about the roles RDs play within community health promotion. Our work in developing and evaluating the ANGCY provided a platform from which to explore some of the unique roles of RDs within health promotion. Findings demonstrated that RDs working in government, academia, community settings, private practice and for industry played an important role throughout the development and implementation of Alberta's nutrition guidelines. Although the positive outcomes of their work were not immediately evident, each of the RDs we have described had the opportunity to positively influence child health through their involvement in developing and implementing Alberta's nutrition guidelines. With respect to implementation of the ANGCY, the role of RDs was crucial, as in all cases of successful ANGCY implementation, industry had sought their assistance. Thus, the skills and expertise of RDs may be important for implementation of government nutrition guidelines. Others have also noted that access to RD expertise was helpful for implementing healthy eating guidelines in sport settings [9] and recreational facilities [10]. Although most other studies in recreational facilities have not explicitly mentioned the role of RDs in this context, there is a clear role for RDs in addressing some of the identified barriers [6, 11, 12].

Some sectors, including government and large industry players proactively sought RD expertise. Others with less ability to pay accessed the services of RDs to a lesser extent. The low priority of nutrition relative to other concerns within some smaller organizations where the budget is limited may have contributed to their limited use of RDs. Elevating the priority of nutrition, and of the RD as a source of valuable nutrition information within these organizations, will be a significant challenge given current fiscal constraints within most sectors.

Informants generally regarded RDs in a positive light, however controversies within the field over what constitutes a healthy food were problematic, and diminished the credibility of RDs. The need for RDs to balance health and taste was also important to industry, as consumers often expect both [13]. The prominence of these issues is likely to grow as industry is increasingly called upon to reformulate products to be healthier, while maintaining their good taste.

Findings presented here are necessarily limited in scope, as they originated from a single study of the barriers to adopting and implementing nutrition guidelines in recreational facilities. Our investigation uncovered some of the novel roles that RDs can play within health promotion, however this list is by no means exhaustive, nor do we claim to have highlighted the most important roles of RDs in this context. Future studies should interview large numbers of RDs regarding the roles they have played within health promotion settings and should examine where their skills can be most effectively applied.

As recognition grows of the need to improve unhealthy food environments, the skills of RDs will be in greater demand in community settings. Current training programs based in a medical model of health must therefore evolve to reflect the changing realities of how it is we understand that health is created and maintained. Increased emphasis on health promotion within undergraduate education is therefore warranted to ensure RDs are well prepared for careers outside of the health care sector. Professional development opportunities will assist existing RDs to expand their scope of practice.

7.4.1 Relevance to practice

The role of the RD is undergoing a transition. In the future, the skills of RDs are likely to be in greater demand in health promotion settings. We have highlighted novel ways in which RDs contributed to efforts to improve children's food environments and identified areas in which their image might be strengthened. Findings call for the profession to incrementally adjust training models to reflect emerging areas of practice. They also highlight the need for creativity and initiative on the part of RDs to proactively seek new avenues in which to apply their valuable skills. These actions will help to ensure that RDs remain the trusted source of food and nutrition information not only in health care, but also within health promotion settings.

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CHAPTER 8: Profit vs public health: The need to improve the food environment in recreational facilities

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8.1 Introduction

A growing body of literature documents the problem of the ubiquitous availability of unhealthy foods in recreational facilities [1-6] and other sport settings. [7] This is concerning because unhealthy food environments negatively impact children's dietary behaviors and body weights. [8-10] To address this problem, several Canadian provinces have developed nutrition guidelines (British Columbia and Alberta), incentive-based programs (Ontario), toolkits (British Columbia, Ontario, Manitoba, Saskatchewan, New Brunswick) and other printed and online resources for the recreation sector. Uptake of Alberta's Nutrition Guidelines for Children and Youth (ANGCY) [11], in particular, has been limited, with only 6% of the 151 facilities surveyed reporting that they had implemented them 1 year following their release. [3] Financial constraints appear to be the most important barrier to offering healthier items in Alberta's recreational facilities, as managers perceive that selling healthier foods is unprofitable. [4] Managers play a gatekeeping role in recreational facility food services, and thus it is particularly important to target their knowledge, beliefs, and perceptions of nutrition guidelines. [4]

On the basis of these findings, we designed an intervention to overcome some of the barriers to offering healthier foods in recreational facilities, and to specifically stimulate uptake of the ANGCY. The study was intended to positively impact managers' knowledge, beliefs and perceptions of nutrition guidelines through: 1) Participation in a 1 day training session to learn about the ANGCY and strategies to offer healthier items without losing revenue, and 2) Interaction with other managers who were successfully using nutrition guidelines through five monthly group meetings. Notably, managers were assured in advance that they would be free to decide how and to what extent to comply with ANGCY recommendations to offer healthier items within their food services. However, despite a lengthy recruiting process facilitated by provincial recreation associations (reach of > 1400 individuals) and Health Promotion Coordinators in communities across the province, the study had to be cancelled due to low enrollment.

The challenge to incent preferential sale of healthier foods in recreational facilities is clearly substantial. Although other factors such as the time commitment associated with study participation were likely influential, comments from managers who declined to participate, and results from past Canadian investigations [2-6, 12, 13] suggest that the barriers to study participation were primarily financially driven. Recreational facility and food service managers felt compelled to generate a profit, but perceived that selling healthier foods as part of the study would be unprofitable, and might jeopardize sponsorship agreements with beverage companies. Economos et al [14] encountered

similar challenges recruiting restaurant managers into an initiative to increase availability of healthier options. By contrast, although similar barriers existed in recreational facilities in British Columbia, a pilot study of 10 facilities proceeded. [5] It is likely that availability of seed funding and substantial implementation resources supported participation in that study, although improvements to recreational facility food environments were limited even within that supportive context. [5]

In general, voluntary guidelines have proven relatively ineffective in encouraging provision of healthier items by the food industry. [15] Similarly, evidence indicates that voluntary guidelines may be ineffective in encouraging meaningful change in recreational facility food environments. [3-5] Mandatory government regulation may therefore be required to ensure that recreational facilities support and do not undermine child health by exposing children to overwhelmingly unhealthy food environments. Prior to enacting regulations, however, it is important to consider their potential positive and negative consequences to ensure a reasonably equitable distribution of costs and benefits.

8.2 Potential advantages

1) Policies mandating provision of primarily or exclusively healthier foods in recreational facilities within specific and short time frames are virtually certain to increase their availability in an efficient manner, provided that policies are enforced. Such policies are associated with improved dietary behaviors and body weight in children, [16] and thus regulation would contribute to important public health objectives. If enacted in multiple settings (eg. schools, childcare, government buildings) regulations might furthermore incent food reformulation by industry, [17, 18] providing healthier default options for all consumers and yielding more widespread health benefits. By improving population health, regulations could also benefit industry by providing a productive workforce to produce and deliver the goods and services they sell, a healthy clientele to purchase them, and a productive economic climate within which to operate.

2) Currently, governments provide partial funding to recreational facilities in support of healthy living, yet actively undermine their own efforts by allowing unhealthy foods to predominate there. Regulations that increase availability of healthier items and curtail availability of unhealthy items would resolve this paradoxical conflict. Coherent policy would furthermore project a consistent message to children that healthy eating and physical activity go hand-in-hand.

3) Regulations are an equitable means of addressing the problem of unhealthy food environments in recreational facilities. Universal regulations would create a level playing field for businesses that provide food services within recreational facilities, reducing the risks associated with compliance. Regulations could also help to correct the unequal distribution of costs and benefits associated with the sale and consumption of unhealthy foods, whereby the benefits primarily accrue to industry while the costs are largely borne by the public.

8.3 Potential disadvantages

1) Corporate profitability might be negatively impacted if, as industry contends, few consumers will purchase healthier items despite increased availability. [4] In reality, however, there is no reason why selling healthier foods cannot be a profitable venture for industry. Indeed, the food industry controls the food supply and not only responds to, but actively shapes consumer demand for its products through marketing. Were it to leverage its vast wealth and resources to develop and market healthier items, it would almost certainly succeed in increasing their sale and consumption by consumers. Even scientists with comparatively limited resources have succeeded in doing so. [19] The problem is not that healthy items are not profitable, but that industry has so far lacked the incentive to make them so.

2) While critics contend government regulation would limit freedom of choice, given the preponderance and extensive marketing of unhealthy foods in recreational facilities, it is difficult to argue that the current environment supports free and independent food purchasing decisions. Therefore, increased or exclusive availability of healthier foods in recreational facilities would not further constrain choice, but would merely change the content of the limited choice that currently exists.

Governments regulate food to ensure its microbial safety and mandate food fortification to prevent nutritional deficiencies because society acknowledges that food choice must sometimes be curtailed to protect public health. In developed nations, morbidity and mortality attributable to unhealthy diets greatly exceeds that attributable to food-borne pathogens and toxins. Therefore, just as regulations prevent industry from purposely selling and marketing foods which are unsafe for microbial reasons, so too should it not be permitted to sell and market foods that are unsafe for nutritional reasons, particularly in venues where children gather, such as recreational facilities. Failure to limit children's access to nutritionally unsafe foods constitutes a violation of society's ethical obligations to protect children.

8.4 Development and implementation of regulations

Unhealthy food environments in recreational facilities are an unintended negative consequence of policies designed to improve access to affordable physical activities by using food service revenues to partially subsidize lower user fees. Regulations are not a panacea, however judicious use of government power to regulate food availability in recreational facilities can redress this oversight and appears advantageous. Although this discussion has focused on children, as they represent the majority of recreational facility users, adults who use recreational facilities may also benefit from regulations.

Regulations should be developed in consultation with all stakeholders, considering each sector's capacities and constraints, while being careful not to allow the economically powerful voice of industry to take precedence over public health concerns. The final regulations should be child-focused, include robust standards for what constitutes a healthy food/beverage (ie. standards should not merely lead to production of healthier junk foods), mandate that a high proportion of items be healthy, prohibit marketing of unhealthy foods, and ensure healthier items are affordable in recreational facilities.

Implementation of regulations will be challenging, as adults who frequent recreational facilities and industry may raise some of the aforementioned objections. It will furthermore take time to denormalize the culture of unhealthy eating that exists. Substantial implementation support will be essential to address these challenges, and regulations should be phased in over several years to provide an adjustment period.

8.5 Conclusion

Government regulation of food availability in recreational facilities appears to offer an efficient, effective and equitable means of aligning the financial interests of the food industry with public health goals. Clearly, these regulations will not solve the complex problem of childhood obesity. Nevertheless, each eating occasion represents an opportunity to influence health, for better or worse. The food environment within recreational facilities is part of a broader context of unhealthy food environments that reinforces a culture of unhealthy eating, detracts from efforts to reverse it, and is a source of contradictory messages. Action to improve recreational facility food environments will help facilities to achieve their wellness mandate, while contributing to a broader culture of healthy eating across societal sectors and settings.

8.6 References

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CHAPTER 9: Nudging healthier dietary behaviors in recreational sports settings: A mixed methods investigation

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9.1 Introduction

Emerging evidence indicates that many health-related decisions are often made very quickly, with little conscious thought. Thus, although many individuals express a rational intention to eat healthfully, in practice they more commonly select unhealthy foods for immediate reasons such as taste and convenience. This intention-behavior gap has been described by behavioral economists as the product of 2 interacting information processing systems in a dual process model [1, 2]. The first is a cognitive system that processes information in a rational manner, thoroughly weighing all options and selecting the best one. Traditional individual-level approaches engage this system through providing information. The second processes information in a non-cognitive manner, making decisions quickly, reflexively, and often in response to environmental cues. While some food-related decisions are made in a thoughtful and considered manner, most are made automatically using the second system, in response to environmental stimuli [1]. Kremers et al [3] have applied dual process thinking to develop a model of the environment-behavior relationship. A dual process model of information processing provides a compelling basis for understanding why, despite an abundance of information and education, dietary behaviors have been resistant to change, highlighting the need to identify and target potent environmental drivers of food intake.

In response, behavioral economists have proposed an environmental approach to behavior change grounded in principles of libertarian paternalism that alters social and physical environments to shift behaviors in self-interested directions without limiting the available options [4, 5]. Nudging, as this strategy is commonly called, is libertarian in the sense that it provides choice, but paternalistic because choices are presented in a manner that favors particular outcomes. Nudging is not new. The food industry has been successfully nudging consumers to purchase its (primarily unhealthy) products for decades. However, nudging is relatively untapped within public health. Wansink and Just are perhaps best known for having successfully nudged the purchase of healthier items through increasing their convenience [6, 7], variety [8], and visibility [9]. Others too have successfully nudged children to select healthier foods through verbal prompts [10, 11], enhancing aesthetic appeal [11], brand characters [12] and increased variety [11]. Studies in adults suggest that descriptive menu labels [13] and increasing the visibility [14] and convenience [15] of obtaining healthier items are also effective in increasing their sales.

While often statistically significant, the impact of nudging has been quantitatively small in many instances [6, 14, 16], raising questions regarding efficacy. Nudges may

therefore be more potent if implemented in combination, or along with more powerful economic incentives, however such investigations are limited, as noted in a recent systematic review [17]. At present, there is no compelling evidence to suggest that nudging alone can improve population health [2]. Studies are needed to test the efficacy of nudges in a variety of populations and settings, to determine optimal combinations, and to ascertain whether nudging is as powerful as more overt tools such as pricing.

In Canada, recreational facilities are publicly funded sport complexes providing access to affordable physical activities. These facilities have been identified as a community setting with substantial potential to improve public health, but which, by virtue of unhealthy food environments, may be paradoxically contributing to obesity risk [18-20]. Managers are receptive to providing healthier options, but are reluctant to do so because they believe patrons will not buy them [19-24]. Nudging is a potentially powerful means of cueing healthier food selection in this setting, which might allow industry to improve food offerings without losing revenue. A literature search was therefore undertaken for promising nudges likely to be feasible for implementation in this context but that had received little study.

The literature search identified several nudges meeting these criteria. The first, taste testing, was judged promising because taste is one of the most important determinants of food selection among both children and adults [25-30]. Many individuals and especially children are, however, neophobic and hesitant to try new, healthful foods [31, 32]. Although taste testing has been a component of successful school [11, 33-36] and grocery store-based [37-40] multi-component dietary interventions, the independent impact of providing food samples to nudge selection of healthful products is not clear. Similarly, descriptive menu labels are a simple, low-cost strategy used by industry to enhance the attractiveness of menu items, but were found to be relatively untested for their independent potential to cue healthier dietary choices [13, 41]. By contrast, the literature review showed that economic incentives have proven consistently capable of shifting the dietary behaviors of children and adults in desirable directions [42, 43], suggesting they might augment the impact of these more subtle nudges.

This study assessed the comparative and additive efficacy of 2 nudges (1. signage with descriptive menu labels; 2. taste testing) and an economic incentive in supporting healthy food purchases by patrons in a naturalistic recreational sports setting. We hypothesized that sales of healthy items would be significantly greater compared to baseline in all intervention periods, with greater increases when nudges were combined, and when they were used together with a pricing incentive.

9.2 Methods

9.2.1 Study design

9.2.1.1 Overview

This study used mixed methods to quantify the impact of 3 environmental interventions on sales of healthy items at an outdoor community pool. An initial pre-intervention control period was followed by 3 successive and additive environmental interventions including: 1) Signage with descriptive menu labels, 2) Addition of a taste testing

intervention, and 3) Addition of a price reduction intervention. Following the third intervention a final post-intervention control period was instituted.

The study was conducted at an urban, municipally-operated outdoor pool adjacent to a recreational facility in the province of Alberta, Canada. The pool was open daily from 11am-7pm (weather-permitting) for 4.5 months of the year. Two concessions were present on-site. The first, a municipally-operated concession, sold exclusively pre-packaged items including a variety of candy, ice cream novelties, granola bars, dessert squares, potato chips, sugar sweetened beverages, fruit juice, diet soda and water. The other concession was privately operated (hereafter referred to as the target concession), and offered a larger menu consisting of main dishes (sandwiches and wraps), beverages (water, sugar sweetened beverages, smoothies, slushes) snacks and desserts (a variety of ice cream and fruit-based dishes) prepared primarily on-site. Data for the study were collected from May - September, 2012.

This study was approved by the Human Research Ethics Board at the University of Alberta. Concession and municipal managers provided written, informed consent to provide data for the study.

9.2.1.2 Menus

A menu was designed for the target concession that included a variety of well-liked options. Menu items were classified as healthy/unhealthy according to the Alberta Nutrition Guidelines for Children and Youth's criteria for 'choose most often' (healthy), 'choose sometimes' (unhealthy), and 'choose least often' (unhealthy) [44]. The final menu consisted of 44.4% healthy items (Table 9.1) and was used during all phases of the study (ie. control and intervention periods). The menu in the municipally-operated concession was unchanged and contained very few (9%) healthy items.

9.2.1.3 Periods

The intervention took place exclusively in the target concession. No changes to product, pricing or promotion were made in the municipally-operated concession during the study. The interventions were additive and their order was determined based on the goals of the study, which were to compare the relative efficacy of single (signage) and multiple (signage and taste testing) nudges alone or together with price reductions, in increasing sales of healthy items. Thus, single and multiple nudges were implemented first to test their sales-stimulating potential in the absence of an economic incentive. Each control and intervention period was instituted for 8 days.

Quality assurance

Food service staff at the target concession received training regarding all study procedures prior to the pre-intervention baseline period. Topics included correct preparation of menu items, accurate keying of customer orders on the cash register, and specific details related to each intervention. Following training, the modified menu was introduced in the target concession and a trial period of 5 days was instituted to allow staff to practice study procedures in advance of data collection. Once the study began, researchers were present continuously within the setting to monitor compliance.

Pre-intervention
During the pre-intervention period menu items were displayed on 28 x 43cm panels containing item names, descriptors, prices and colorful photos. Signage was placed 2-3 feet above ground-level so that even very young children could easily see and touch the signs.

Signage intervention
We developed and pre-tested new descriptive names for healthy items that would appeal to children (Table 9.2). To draw attention to the new names the height of the panels advertising healthy items was doubled in size and signs were positioned as close as possible to the cash register. Signage for unhealthy items remained unchanged.

Signage + taste testing intervention
After the signage intervention had been in place for 8 days, a taste testing intervention was added. During this period small samples of healthy items (Table 9.2) were distributed to pool patrons between 1130am and 3pm daily for 8 days.

Signage + taste testing + price reduction intervention
After the second intervention had been in place for 8 days, a 30% price reduction on healthy items was added (Table 9.2). Bright red '30% off' signs were placed on the panels advertising healthy items. Post-discount prices of healthy items were below those of comparable unhealthy items.

Post-intervention
Following the intervention periods baseline conditions were re-instituted for 8 days.

9.2.2 Data collection
The primary outcome was the change in sales of healthy items in the intervention periods relative to pre- and post-intervention in the full sample and in a subsample of patrons whose purchases were directly observed. Secondary outcomes included change in the caloric value of purchases, change in revenues and gross profits, and qualitative process observations.

9.2.2.1 Quantitative outcomes
Sales
Itemized cash register sales data for all items sold were collected from both concessions throughout the study. Data from the municipally-operated concession were used to provide an indication of fluctuations in sales patterns due to the passage of time, and whether the interventions influenced food purchases outside of the target concession. The municipality provided information regarding the number of pool users each day.

Revenues and gross profits
The target concession provided costs for purchasing raw ingredients and other supplies (eg. cups, spoons) for menu items. This information was used to calculate the food cost per item. Revenues per item were calculated as the number of items sold multiplied by the price. Gross profits per item was calculated as the difference between revenue and

food costs. Labour costs were not included as they were similar for comparable healthy and unhealthy items and preparation times for all menu items were minimal.

Caloric content

The caloric content of all items on the target concession's menu was calculated using information obtained from package labels, manufacturer's websites and where necessary from the Canadian Nutrient File (version 2010) and Food Processor SQL (version 10.11.0 ESHA Research Inc., Salem, Oregon).

Quantitative observations of concession patrons

We assessed whether sales of healthy items in each study period differed according to demographic characteristics of patrons. To provide an unbiased estimate of purchases, observers directly observed patrons' purchases in an unobtrusive manner. Beginning at lunch time, an observer recorded observations for 5 consecutive hours per day, for 2 days per period on at least 1 weekday and 1 weekend day. An extra day of data collection per period was added when sales volumes were not sufficiently high on the 2 scheduled observation days. Observers were stationed within close proximity to the cash register and could visually see all patrons, hear items being ordered, and see what was printed on each meal receipt.

For each individual who made a purchase, observers recorded their best estimation of the purchaser (adult alone, child alone, both present), their sex, body mass index (BMI; non-overweight, overweight/obese, unknown), and items purchased. Observations were recorded on purpose-developed forms that had been pre-tested. Observers used figural silhouettes for adults (9 for men, 9 for women) [45] and children (7 for boys, 7 for girls) [46] to assist in estimating weight status. When children and adults purchased items in groups, observers did not record sex or BMI as it was not possible to record full details for all group members.

The first author and observer trained the second observer, a senior nutrition student, in data collection procedures. Rates of agreement and kappa statistics for inter-rater reliability for demographic variables were moderate to high, ranging from 64% to 93% and from 0.57 to 0.96, respectively, all with p values < 0.001. Agreement was high for identification of menu items, ranging from 83% to 100%, but was lower for 2 menu items, as slushes (43%)/smoothies (65%) and waffle cones (22%)/regular ice cream cones (46%) were sometimes confused. These discrepancies did not alter our findings because these items have identical health ratings.

9.2.2.2 Qualitative process observations

Qualitative process observations were collected to provide context for, and explain quantitative observations and sales data. The same 2 observers recorded process observations so that, through prolonged engagement, they could become intimately familiar with the setting and patrons' behaviors within the setting. One observer recorded qualitative observations of pool patrons, while the other recorded qualitative observations of business operations. Joint observation sessions between observers were held at least once per period to provide corroboration, sensitize observers to other

potentially influential environmental factors, and provide opportunities for critical reflection. Patterns in the data and ways to improve data collection were also discussed.

Qualitative observations of pool patrons

A single observer recorded qualitative observations regarding patrons' dietary and physical activity behaviors for 5 consecutive hours per day for 11 days during the study, with 2-3 observation sessions per period excluding the final post-intervention phase. This observer adhered to principles of passive participation [47] in which she was regularly present in the setting but did not participate to any significant extent in pool-related activities.

Qualitative observations of business operations

The first author observed the operation of the business from the perspective of an active participant [47]. The observer immersed herself in the setting, working alongside managers and staff to become familiar with many aspects of the business, including routine tasks such as procurement, food preparation, customer service, promotions and staff management. This hands-on approach provided an in-depth perspective of the practical realities of the industry, and the feasibility of using environmental change strategies in this context. It also ensured fidelity to the study protocol, as the observer could directly monitor delivery of the interventions and data collection procedures.

9.2.3 Data analysis

9.2.3.1 Quantitative outcomes

An analysis of covariance using the mixed procedure of SAS version 9.2 (Cary, NC) was used to estimate the impact of the interventions on sales in the target concession considered in 3 ways: 1) Number of items sold, 2) The caloric content of items sold, and 3) Revenues and gross profits. The main effects considered were period (ie. pre- and post-intervention and the 3 intervention periods), type of item (ie. main dishes, side items, snacks and desserts) and nutritional quality (ie. healthy, unhealthy), and all interactions. The main effects of type of item are discussed in Chapter 10. Sales during the pre- and post-intervention periods did not differ significantly and therefore they were combined. The dependent variable means were adjusted for the highest air temperature reached each day (Canadian National Climate Data and Information Archive), hours of operation in the target concession, and the number of pool patrons. The number of adult patrons was the only significant covariate. Inclusion of a term indicating whether sales occurred on a weekend or weekday did not alter estimates, and therefore this term was not included in the final model.

A chi-square analysis using proc catmod and proc freq (SAS version 9.2, Cary, NC) was performed to assess the impact of the interventions on purchases by individuals in the directly observed subsample, with the nutritional quality of menu items modeled as a categorical dependent variable (healthy/unhealthy). The main effects considered were purchaser (eg. adult alone, child alone or both present), period (pre and post-intervention and the 3 interventions periods), BMI and sex. Sales differed significantly in the pre- and post-intervention periods and therefore they were kept separate for the analysis. All 2-way interactions were included in all models. Observations where the purchasers' BMI was uncertain were removed from the data set (n=139 purchases), as

were observations of pregnant women (n=6 purchases), yielding a final sample of 2512 items sold.

When the results of the primary analyses were significant, post-hoc t-tests and 2 x 2 tables were used to determine which means differed significantly from one another. Statistical significance was indicated at $p < 0.05$.

9.2.3.2 Qualitative process observations

Qualitative observations were transcribed and analysed using thematic content analysis. Comparison of findings from each period showed that patrons' behaviors were similar across all periods, and thus observations were integrated across periods. Peer-debriefing served to verify the findings.

9.3 Results

9.3.1 Overall sales at the target concession

During the course of the study there were 6175 items sold in the target concession, of which 40.8% were healthy (Table 9.3). The number of healthy items sold was significantly lower than the number of unhealthy items sold ($p < 0.0001$).

9.3.2 Overall revenues and gross profits at the target concession

Average daily revenues (data not shown) and gross profits (Table 9.3) from unhealthy items were significantly greater than from healthy items ($p<0.0001$), with healthy items generating 34.1% of gross profits (Figure 9.1). The mean daily food cost as a proportion of gross profits was higher for healthy compared to unhealthy items (Figure 9.1).

The cost to implement the signage intervention was approximately $1500, while the cost to add taste testing approached $200. The additional cost of the price reductions was nearly $600 in lost revenue.

9.3.3 Impact of the interventions at the target concession

Total sales volumes, the number of calories purchased, and revenues and gross profits from healthy and unhealthy items did not differ by period in the target concession (Table 9.3).

9.3.4 Impact of the interventions at the municipally-operated concession

Total sales volumes and sales of healthy and unhealthy items did not differ by period in the municipally-operated concession.

9.3.5 Demographic characteristics of patrons and association with food purchases

Observers witnessed the purchase of 2512 items at the target concession (40.7% of all items sold at the target concession); 41.1% of these items were purchased by adults alone (64.0% female, 38.7% overweight/obese), 15.9% by children alone (55.8% female, 14.3 % overweight/obese) and 43.0% by adults and children together.

More than 41% of items purchased by individuals in the subsample were healthy. The proportion of healthy items sold differed according to who was present during the purchase ($p<0.01$; Table 9.4). When only adults were present, 43.5% of items purchased were healthy, significantly more than when both adults and children (39.0%), or only children (35.8%) were present. These trends were similar when the caloric value of purchases was examined. When only children were present the caloric value of purchases was significantly higher (260 ± 11 kcals) than when adults alone (225 ± 5 kcals) or both children and adults (212 ± 5 kcals) were present ($p<0.001$).

The proportion of healthy items sold differed by period in this subsample of patrons ($p<0.01$; Table 9.4). An initial 12.7% increase in sales of healthy items during the signage intervention did not reach statistical significance, although the signage + taste testing and the signage + taste testing + price reduction interventions increased selection of healthy items relative to the pre-intervention period by 30.4% and 28.7%, respectively. These increases were maintained in the final post-intervention period, as sales of healthy items remained 33.3% above pre-intervention levels. Sales of healthy items were equivalent across all 3 intervention periods and the post-intervention phase. For purchases where only adults or only children were present, the effectiveness of the interventions differed according to the BMI and sex of the purchaser, with overweight/obese individuals exhibiting greater sensitivity to the signage + taste testing + pricing intervention and less to the signage intervention compared to those who were not overweight, and males being less responsive to taste testing + signage but more responsive to the signage + taste testing + pricing intervention compared to females ($p<0.01$). Figure 9.2 compares findings by period for the full sample and the subsample.

9.3.6 Qualitative observations of patrons

Patrons were primarily children accompanied by their parents, and most often by their mothers. Many races were represented, however patrons were primarily Caucasian. There was a sense of enthusiasm and fun in the atmosphere, with much laughter and play. During their visit, patrons alternated between time spent in and outside the pool. Almost all patrons ate at some point during their visit, and most ate intermittently. It was common for families to pack a picnic lunch and supplement with items from the concessions. Social influences were evident around food. Children who approached the target concession with their peers often purchased identical items. Parents also exerted significant control over their children's eating. They determined the range of choices on offer and were often the ones to initiate eating. Many were observed prodding their children to eat now, to wait to eat until later, to eat only certain items, or to eat at all. Children, however, were also accorded substantial input into food-related decisions as evidenced by the parental-child discussions that occurred around food.

During the interventions children were observed interacting with the colorful displays, however few ordered the fresh fruit they were promoting. During taste testing most patrons were enthusiastic to sample items, although a small minority declined to take a sample. Few patrons commented on the price reductions. Overall, very few patrons inquired about the healthfulness of menu items.

9.3.7 Qualitative observations of business operations

Challenges associated with offering healthy items in a commercial setting are detailed below.

9.3.7.1 Complying with provincial nutrition standards

While it was relatively simple to create healthy side items for the target concession's menu (eg. fresh fruit trays), it was much more difficult to develop healthy main dish items that met the provincial nutrition standard for 'choose most often' using commercially available ingredients, as for instance, items with ≥ 300 kcals could not exceed 700mg of sodium. Some items could therefore not be made to fit the 'choose most often' standard.

9.3.7.2 Food preparation

It was challenging to ensure consistent preparation of healthy menu items in a busy environment with rotating staff. Even slight deviations, such as adding an extra slice of chicken breast to sandwiches, using a regular versus a low sodium sauce, or preparing a wrap on a white rather than a whole wheat tortilla could cause a healthy item to be classified as unhealthy. Precise control of portion sizes was not possible due to time constraints, as staff did not have time to measure individual ingredients.

9.3.7.3 Patron requests

Patrons sometimes requested unhealthy modifications to healthy menu items, such as adding chocolate sauce or whipped cream to fruit. Although infrequent, managers felt compelled to accede to such requests.

9.3.7.4 Communication

It was challenging to market healthy items in a manner that communicated their healthfulness without stigmatizing them as inferior in taste [48]. Signage had to be understandable and usable within the few seconds typically allocated to food selection in restaurant settings while using limited text.

9.4 Discussion

To successfully navigate the obesogenic food landscape requires constant vigilance, a task that is cognitively depleting and therefore difficult to perform consistently [1, 49]. By rearranging the food environment in a manner that facilitates healthier choices, nudging might help to counter the environmental push to select unhealthy options. This study found mixed evidence for the efficacy of 3 approaches to nudging healthy dietary choices at a population-level. Overall, single or multiple nudges, or multiple nudges concurrent with price reductions did not influence the sale of healthy items at a community pool. Direct observations of a subset of patrons' purchases, however, showed an approximately 30% increase in sales of healthy items when a signage + taste testing intervention was implemented, an increase that was maintained when prices of healthy items were reduced by 30%, and even when all interventions were removed.

It is unclear why results differed in the full and subsamples. The subsample captured a large proportion of total purchases during the study (40.7%), albeit still a minority. As previously described, inclusion in the subsample was determined exclusively by the time

of day purchases were made, and coincided with the busiest times of day. Patrons who purchased items during these times may therefore have differed from those who purchased items at other times in a manner that made them more responsive to changes in the food environment. Overall, the proportion of healthy items purchased by individuals in the full (40.8%) and subsample (41.3%) was not different. It is possible that item misclassification on the part of observers might account for our mixed findings. This appears unlikely, however, because there was high congruence between observers and they could visually see all items being ordered and the printed list of items on receipts. It is also possible that patrons ordered healthy items because observers were present, although this too appears unlikely to account for our findings as observers were present during both control and intervention periods and their presence and purpose were not readily apparent. Differences in the statistical procedures used to analyse the two data sets might also be responsible, although our methods are consistent with others [50].

9.4.1 Intervention impact

We implemented 2 nudges that have received little study, finding mixed evidence for their efficacy. We first tested the efficacy of descriptive menu labels, a strategy commonly used by the restaurant industry to improve consumers' taste expectations [41]. Wansink et al [13] previously showed that sales of targeted (healthy and unhealthy) items in a University faculty cafeteria increased by 27% when they were given descriptive menu labels. We created descriptive menu labels for healthy items only, and although we increased the size of the signs on which they were placed, there was no impact of this change on sales of healthy items. When a taste testing intervention was added the results were mixed, as there was no apparent impact in the full sample, however sales in the subsample increased by 30% relative to baseline. The latter findings are in line with studies showing that repeated exposure to healthier foods can counter children's naturally neophobic tendencies [32], and that free product samples distributed to neophobic young adults can increase selection of unfamiliar healthful food products by 14.6% [31]. Our findings in the subsample suggest an even stronger impact of taste testing, as participants were in a natural setting where they were required to pay for a full portion of the healthy items they had tasted. Qualitative studies suggest that children are particularly reluctant to expend money on new food choices or on fruit and vegetables which might taste bad, as opposed to packaged junk foods which always taste the same [29]. Our findings suggest taste testing might help to reduce this perceived risk, thereby nudging purchase of novel, healthier items in some community settings.

Systematic reviews have found subsidies/price reductions on healthier foods to be an effective means of increasing their purchase and consumption in a variety of settings [43, 51, 52]. This has not always proven to be the case in single [53, 54], or combined interventions [43, 51], however, suggesting that price may not always drive food purchases and that some populations are more price sensitive than others. In particular, low income populations, for whom food represents a larger proportion of total expenditures, are predictably more price sensitive [55-59].

In the present study, sales of healthy items remained constant in the full and subsamples when a pricing intervention was added, suggesting that price reductions did not incent purchase of healthy items in this context. Although it is possible that the impact of the signage + taste testing intervention in the subsample might have waned had a price reduction not been added, it appears more probable that price reductions were ineffective because our study sample likely represented a population with higher socioeconomic status (SES). There are several reasons to suspect that pool patrons represented a higher SES group. The study took place in one of the wealthiest jurisdictions in North America [60, 61] and the pool was proximal to several wealthy neighborhoods. In addition, the pool was not readily accessible on foot or via public transit, and had a relatively high entrance fee, factors that have been shown to deter youth in low SES groups from participating in physical activity [62]. Observers also noted that many families appeared well off, paid cash for their purchases, and that few children were overweight/obese. Higher SES populations might not perceive a 30% financial savings to be worth the non-monetary costs (poorer taste, reduced satisfaction) of consuming healthy items. Alternatively, price reductions might have been more effective had other healthy items been targeted, as the efficacy of price reductions differs by item [53, 63]. Many of the healthy items targeted in this study contained fruit, and the demand for fruit is relatively inelastic [55, 56, 64, 65].

Limited impacts of the interventions are perhaps unsurprising in light of the social ecologic framework, which suggests that health behaviors are shaped by reciprocal interactions among individual, social, and environmental factors. Nudging is a very subtle technique, perhaps too subtle to counter the powerful influence of other environmental factors, such as food marketing, or individual factors such as food preferences or purchasing intentions. Indeed, the impact of nudging on food selection in many studies has been relatively small [6, 14, 16] and inconsistent. Nudges that have proven effective in one context [14, 66, 67] have had null [50, 68], or even opposite impacts in others [69], and outcomes sometimes differ widely for individual items [14, 66, 67, 70]. Our findings are similar, as nudges that were not effective in the full sample were effective among a subsample of patrons, and their impact differed significantly according to the BMI and sex of the purchaser, suggesting differential sensitivity to specific food environment characteristics. Nudges might be more effective if incorporated within multi-component interventions, or if carefully matched to the particular circumstances of a target population and setting.

Other explanations for our findings might include the fact that many healthy menu items were similar to the contents of patrons' home-packed lunches, making them less attractive compared to many unhealthy menu items which could not be brought from home due to temperature restrictions (eg. ice cream cones, grilled cheese). Second, given that few children were overweight, parents may not have perceived a need to closely regulate children's intake of unhealthy items [71]. Third, the interventions may have had limited reach. Although the signage advertising the new names and price reductions on healthy items was colorful and prominent, it may not have captured the attention of consumers in the few seconds typically allocated to food selection in away-from-home settings [50, 71-73], particularly given the excited atmosphere [74]. Similarly, not all patrons participated in taste testing. Fourth, we only promoted the

sale of the most healthy items on the menu. Other studies have combined healthy and moderately healthy items into a 'healthier' category. Our results may have differed had we also promoted the sale of moderately healthy items, as the taste profiles of these foods are more compatible with consumer taste preferences. Lytle [75] has suggested that when food access is limited by factors such as low-income, individuals may be more susceptible to influences within the physical food environment. Thus, it is possible that the higher SES of the study sample might also underlie their relative insensitivity to the interventions. Finally, health is only one of many things that individuals value. Children, in particular, have difficulty perceiving the long-term health consequences of dietary choices, and tend to prioritize taste, particularly when eating outside the home [29, 76]. Visits to the pool were a fun family outing and therefore parents may have been more likely to allow indulgences and to accede to children's food requests [77, 78].

9.4.2 Other findings

Compared to purchases made by adults alone or by children and adults together, when children were alone they purchased more unhealthy items and items with significantly more calories. Children perceive that purchase and preparation of fruits and vegetables are adult tasks [29]. Thus, it may be wise for parents to at least accompany children during food selection. Notably, however, adult choices were not substantially better than the choices made by children alone, a finding also observed by others [76, 79, 80]. In qualitative studies parents admit that they purchase unhealthy foods for their children because other concerns, such as convenience and cost sometimes take precedence over health [81-83]. Indeed, adults may be equally susceptible to environmentally-cued food selection, suggesting that all groups may benefit from increased availability of healthy options in recreational sports settings. It is important that adults select healthier options not only for their children, but also for themselves, to support health, and because parental role modeling significantly influences the dietary behaviors of children [84, 85].

In contrast to industry's contention that healthy items do not sell in recreational sports settings [23, 24], healthy items were popular among pool patrons and represented 40.8% of items sold. Their share of gross profits was somewhat lower, at 34.1%, as the cost to purchase raw ingredients was higher for healthy foods relative to the profit they generated. Managers can find ways to further minimize food costs, however, as minimizing food costs was not an explicit study goal. In addition, lower profits on healthy items could be offset by increasing the price of unhealthy items [57, 86]. None of the interventions increased overall sales volumes as has been seen in other studies [50, 87, 88], a beneficial finding from a public health perspective, but one that is contrary to the profit motive of industry; however, neither did they adversely affect gross profits, and all were relatively inexpensive to implement and administer. This study also identified a number of non-monetary challenges related to offering healthy items that were encountered by industry. The importance of working with the food industry to improve food environments has been recently highlighted [24, 89] and it will therefore be important to address these barriers to ensure they do not impede much needed improvements to food environments.

9.4.3 Strengths and limitations

Researchers implemented all interventions in conjunction with concession staff and monitored them closely to ensure high fidelity. Thus, null results cannot be attributed to poor execution of interventions. The study was performed in a real-world setting with all of its constraints and supports, increasing the validity of findings. An important strength of this study was that anonymous sales data were augmented by objective measures of food selection in a subsample of patrons for whom selected demographic characteristics were recorded. These strengths are balanced by several limitations, as observer error in this respect may have introduced bias. Our findings related to sex and BMI-specific effects of the interventions apply only to purchases made by adults and children alone, and should therefore be regarded as a preliminary indication of the need for additional study of effect modifiers in this context. We collected observations of patrons who purchased items in the target concession, however these individuals do not necessarily represent those who contributed to the food purchasing decision or those who consumed the items. It is also not clear whether our findings have implications for dietary intake and body weight outcomes. If the changes observed are contextually specific, are not sustained over time, or do not lead to displacement of energy-dense foods in the diet, then these interventions may have little to no real impact. Given that the interventions were additive it was not possible to isolate their individual effects. Moreover, findings may not be generalizable to other settings and populations, or to sales of other healthy foods.

9.4.4 Future directions

There is no precise, operational definition of nudging [2]. To date, nudging has principally been used in an ad hoc manner and there is a need for a more robust theoretical underpinning to inform development and implementation of interventions [90]. A variety of data will be needed to achieve this outcome. Future studies should compare the relative efficacy of nudges implemented in different populations and settings, alone or in combination, and at multiple decision points such as when selecting a restaurant, at the point of ordering, during meal consumption, and at subsequent meals. The current literature suffers from heterogeneity in study outcomes, intervention sites, types of interventions, participants, outcome measures and types of meals [17], and it will therefore be important that future studies be designed in a manner that facilitates cross-study comparisons. Studies should also incorporate process measures to assist in understanding why some nudges work in some settings and others do not. Longer-term studies are needed, as the efficacy of nudges implemented in the same manner for the same foods might wane over time.

9.5 Conclusions

The notion that food choices can ever be free and independent is illusory at best, as the environment must always be arranged so as to influence choice in some manner [5]. Nudging's soft paternalistic approach may represent an acceptable compromise between libertarians who advocate for free choice and those wishing to eradicate negative environmental exposures. This study, however, found mixed evidence for the efficacy of nudging in cueing healthier dietary behaviors. Moreover, price reductions appeared ineffectual in this setting. Our findings point to complex, context-specific patterns of effectiveness. Given nudging's small and inconsistent impacts to date, it

should not supplant the use of other proven strategies, but should be regarded as one more tool in the obesity prevention toolbox that may be useful in particular contexts. The challenge for public health will be to identify optimal combinations and contexts in which to apply nudges and leverage their strengths within a social ecological framework. Premature reliance on nudging in the absence of such information could prove harmful if more effective interventions are neglected as a result [17].

9.6 Tables

Table 9.1 Nutritional characteristics of the target concession's menu

	Healthy[a]	**Unhealthy**[a]
Main dishes	25%	75%
Snacks and desserts	50%	50%
Beverages	55.6%	44.4%
Total	44.4%	55.5%
Average caloric content per item	144 kcals	283 kcals

[a]Healthy items met the definition of 'choose most often' in the Alberta Nutrition Guidelines for Children and Youth [44]. Unhealthy items met the definition of 'choose sometimes' and 'choose least often'.

Table 9.2 Healthy menu items with descriptive menu labels and reduced prices

Original name	Descriptive menu label	Original price	30% off reduced price
Watermelon slushie	Wacky wundermelon slushie	$3.50 (regular) $2.50 (small)	$2.45 (regular) $1.75 (small)
Watermelon and frozen strawberry slushie	Wonderful waterberry slushie	$3.50 (regular) $2.50 (small)	$2.45 (regular) $1.75 (small)
The coco cabana smoothie	Creamy coco banana smoothie	$3.50 (regular) $2.50 (small)	$2.45 (regular) $1.75 (small)
Very berry smoothie	The purple moo smoothie	$3.50 (regular) $2.50 (small)	$2.45 (regular) $1.75 (small)
Water	Iced spring water	$1.00	$0.70
Fresh fruit	Fruit ninja	$1.00	$0.70
Fresh fruit tray with fruit dipping sauce	Fresh fruit dippers with verry berry dipping sauce	$2.50	$1.75
Frozen banana	Frozen funky monkey	$1.50	$1.05
Fruit kebab with fruit dipping sauce	Funtastic fruit kebab with verry berry dipping sauce	$2.50	$1.75
Grilled banana	Grilled bananarama boat	$1.50	$1.05
Roast chicken sandwich	Decked out chicken sandwich	$4.95	$3.46
Loaded teriyaki chicken wrap	Funky teriyaki chicken wrap	$4.95	$3.46

Table 9.3 Mean daily sales and gross profits, n ± SEM (%)

	Pre- and post-intervention[a]	**Signage**	**Signage + taste**	**Signage + taste + price**	**P value for interaction with period**	**Overall mean for all periods**	**P value for main effect**
Mean daily number of items sold[b]							
Dietary quality					*NS*		*< 0.0001*
Healthy items	18.1 ± 2.4 (37.7)	21.5 ± 3.2 (42.3)	18.4 ± 3.3 (35.7)	27.4 ± 3.2 (46.5)		21.4 ±1.5* (40.8)	
Unhealthy items	29.9 ± 2.4 (62.3)	29.4 ± 3.2 (57.7)	33.1 ± 3.3 (64.3)	31.5 ± 3.2 (53.5)		31.0 ± 1.5 (59.2)	
Mean total daily sales	24.0 ± 1.8 (23.0)	25.4 ± 2.3 (24.3)	25.7 ± 2.4 (24.6)	29.4 ± 2.3 (28.1)		25.7 ± 1.8	*NS*
Mean daily number of calories sold[b]							
Dietary quality					*NS*		*< 0.0001*
Healthy items	3067 ± 636 (27.6)	3860 ± 847 (33.0)	2766 ± 877 (23.5)	4955 ± 857 (37.0)		3662 ± 396* (30.5)	
Unhealthy items	8041 ± 636 (72.4)	7821 ± 847 (67.0)	8999 ± 877 (76.5)	8448 ± 857 (63.0)		8327 ± 396 (69.5)	
Mean total calories sold	5554 ± 480 (23.2)	5841 ± 606 (24.4)	5883 ± 647 (24.5)	6701 ± 620 (27.9)		5907 ± 381	*NS*
Mean daily gross profits in dollars[b]							
Dietary quality					*NS*		*< 0.0001*
Healthy items	40.52 ± 6.20 (35.0)	46.05 ± 8.25 (38.3)	38.92 ± 8.53 (31.5)	37.04 ± 8.34 (31.8)		40.63 ± 3.85* (34.1)	
Unhealthy items	75.29 ± 6.20 (65.0)	74.27 ± 8.25 (61.7)	84.60 ± 8.53 (68.5)	79.49 ± 8.34 (68.2)		78.41 ± 3.85 (65.9)	
Mean total daily gross profits	57.91 ± 4.67 (24.3)	60.16 ± 5.91 (25.3)	61.76 ± 6.29 (25.9)	58.26 ± 6.03 (24.5)		59.20 ± 3.82	*NS*

n=6175 items sold during the study; ANCOVA was used to test for main effects and interactions.
[a]Values for the pre- and post-intervention periods were combined as they were not significantly different.
[b]Values are adjusted for daily hours of operation, number of pool patrons, and maximum temperature reached.
[*]Value differs significantly from the corresponding value for unhealthy items, $p<0.05$.

Table 9.4 Proportion (%) of purchases that were healthy in each period according to purchaser and characteristics of the purchaser

	Pre-intervention	Signage	Signage + taste	Signage + taste + price	Post-intervention	P value for interaction with period	Overall mean for all periods	P value for main effect
Purchaser						*NS*		*0.0068*
Adult only	39.8	40.8	42.4	45.3	46.8		$43.5^{\dagger}$	
Child only	26.6	27.3	47.5	35.8	40.8		$35.8^{\ddagger}$	
Both present	30.6	35.4	40.3	46.8	35.6		$39.0^{\ddagger}$	
BMI[a]						*0.0014*		*0.0125*
Non-overweight	32.6	$44.7^{\dagger}$	46.1	$40.5^{\dagger}$	45.9		42.1	
Overweight	35.7	$27.5^{\ddagger}$	35.6	$50.8^{\ddagger}$	43.4		39.7	
Sex[a]						*0.0094*		*NS*
Male	30.3	38.6	$33.6^{\dagger}$	$50.3^{\dagger}$	42.5		41.3	
Female	35.3	37.5	$50.6^{\ddagger}$	$38.0^{\ddagger}$	46.0		41.3	
Overall mean	33.7	37.9	43.9^{*}	43.3^{*}	44.9^{*}		41.3	*0.0048*

n=1032 items purchased by adults alone, n=400 by children alone, and n=1080 by adults and children together; A chi-square analysis was used to test for main effects and interactions.

[a]The BMI and sex of the purchaser was only recorded for transactions involving adults only and children only. It was not recorded when both adults and children were present during the transaction.

*Significantly different from pre-intervention, $p < 0.05$.

†,‡Values within a column with different superscripts are significantly different for that effect, $p<0.05$.

9.7 Figures

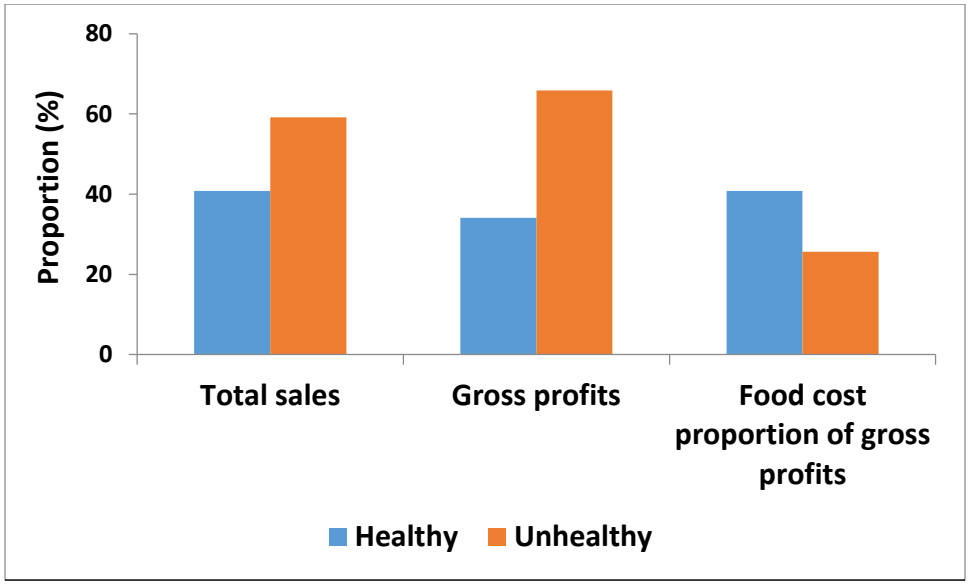

Figure 9.1 Total sales, gross profits, and food costs as a proportion of gross profits for healthy and unhealthy items across the 5 study periods

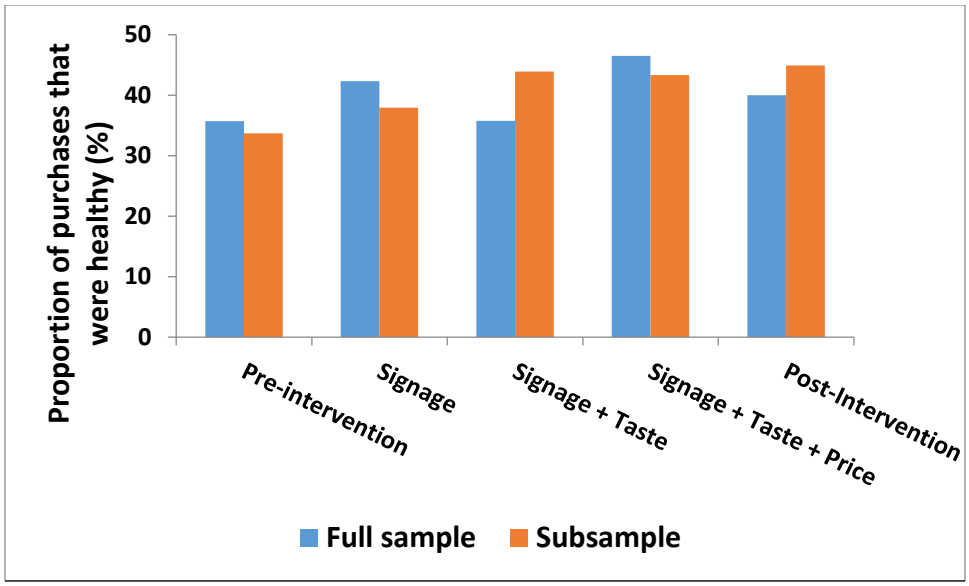

Figure 9.2 Purchase of healthy items in the full sample and in the subsample during each of the 5 study periods

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CHAPTER 10: If we offer it, will they buy it? Sales of healthy foods mirror their availability in community commercial settings

A version of this paper has been submitted for publication. Olstad DL, Goonewardene LA, McCargar LJ, Raine KD. If we offer it, will they buy it? Sales of healthy foods mirror their availability in community commercial settings. Submitted to Public Health Nutrition.

10.1 Introduction

The intractable nature of the obesity epidemic illustrates the power of environmental forces to overwhelm individuals' rational decision making abilities and best intentions, as given the choice, most individuals would not choose to be obese. That many individuals persist in unhealthy dietary behaviors despite knowing what they 'ought' to do is consistent with behavioral economic theory, which posits that many decisions, and in particular food-related decisions, are made rapidly, in a non-cognitive manner, and in response to environmental stimuli [1]. Thus, individuals make quick judgments about what to eat based not on whether foods will maximize their long-term health, but primarily for short-term hedonic pursuits [2]. This account of human behavior suggests that environmental changes that facilitate healthier choices may hold the key to improving population-level dietary behaviors.

Increasing the availability of healthier foods within homes [3-5] and schools [6, 7] is one type of environmental change that has been consistently associated with improved dietary behaviors among children. The potential effectiveness of this strategy within the broader community including the commercial sector is not known, however, as few studies exist [8-11]. If changes to food environments within homes and schools are to improve health, concurrent, parallel changes must be implemented in other settings, creating a layering effect such that a large proportion of individuals are consistently exposed to a diverse array of healthy food options. Rigorous evaluation of the impact of increased availability of healthy foods on dietary behaviors in multiple contexts is therefore essential.

In Canada, recreational facilities are publicly funded sport complexes. These facilities are an important resource for health promotion because they house a variety of community events and provide access to affordable physical activities. However, despite their health mandate, the availability of healthier foods in community recreational facilities is limited [12-14]. Sports settings in other nations have similarly been identified as venues for unhealthy eating [15-19]. Recreational facility managers are reluctant to voluntarily offer healthier options because they perceive that healthier foods are not profitable [20-22]. Moreover, the appropriateness of increasing availability of healthier options through voluntary or mandated measures in recreational sports settings is contested, in part because unhealthy options are normative in these settings and many believe that individuals are sufficiently active while there to offset

their caloric intake [23]. Thus, studies are needed to investigate how to improve food selection in this community context.

This analysis took place within the context of a larger study that found mixed evidence for the efficacy of 3 successive and additive environmental interventions in cueing healthier dietary behaviors at an outdoor community pool [24]. These strategies had all proven effective in other studies, and therefore our findings pointed to complex, context-specific patterns of effectiveness of environmental interventions, and underlined the importance of investigating, rather than assuming, that increased availability of healthy items would necessarily increase their purchase in all settings. Thus, the purpose of the present study was to assess the independent contribution of increased availability of healthy foods to their sales in a naturalistic recreational sport commercial setting. We hypothesized that sales of healthy items would increase significantly when they were more available. As secondary outcomes we examined the popularity of menu items, and estimated whether individuals appeared to be sufficiently active to offset their caloric intake in this context.

10.2 Methods

10.2.1 Study design

10.2.1.1 Overview

The study took place at an outdoor pool adjacent to a recreational facility in an urban setting in Alberta, Canada. Given the northern location, the pool was only open between May and September each year. Two concessions were present on-site. The first, a municipally-operated concession, was open for the full pool-operating season (ie. May through September). This concession sold exclusively pre-packaged items including a variety of candy, ice cream novelties, granola bars, dessert squares, potato chips, sugar sweetened beverages, fruit juice, diet soda and water. The second, hereafter referred to as the target concession, was privately operated, and was open only from July to August each year. This concession offered a larger menu consisting of main dishes (sandwiches and wraps), beverages (water, sugar sweetened beverages, fruit smoothies and slushes) snacks and desserts (a variety of ice cream and fruit-based dishes) prepared on-site.

Data were collected in 2012. The study was approved by the Human Research Ethics Board at the University of Alberta. Concession and municipal managers provided written, informed consent to provide data for the study.

10.2.1.2 Menus

To assess the impact of increased availability of healthy items on their sales, a menu was designed for the target concession containing a higher proportion of healthy items relative to the municipally-operated concession (Table 10.1). Menu items were classified as healthy/unhealthy according to the Alberta Nutrition Guidelines for Children and Youth criteria for ‘choose most often’ (healthy), ‘choose sometimes’ (unhealthy), and ‘choose least often’ (unhealthy) [25]. The menu in the municipally operated concession was unchanged and contained very few healthy items.

10.2.1.3 Periods

Pre-intervention

During the 35 day pre-intervention period only the municipally-operated concession was open, and therefore the availability of healthy items was low (9%).

Quality assurance

Food service staff at the target concession received training regarding all study procedures prior to the intervention period. Topics included correct preparation of menu items, accurate keying of customer orders on the cash register, and other study-related details. Following training, the target concession opened for the summer with its new, modified menu. A 5 day trial period was instituted to allow staff to familiarize themselves with the new menu and study procedures. Sales data from both concessions during this trial period were excluded from the analysis.

Intervention

Following the quality assurance period, data collection for the 40 day intervention period commenced. Both concessions were open throughout the intervention period, increasing the availability of healthy items from 9% to 25% overall (44% within the target concession itself). Researchers were present continuously within the setting to monitor compliance.

Post-intervention

Following the intervention period the target concession closed and the municipally-operated concession remained open for the duration of the pool operating season. Due to inclement weather this period was 6 days in length.

10.2.2 Data collection

10.2.2.1 Sales data

Itemized cash register sales data for all items sold were provided by both concessions throughout the study. The municipality provided information regarding the number of pool users each day.

10.2.2.2 Observations

To assess time spent in activity and food items eaten, the same trained observer, a senior nutrition student, recorded quantitative observations regarding patrons' dietary and physical activity behaviors on 11 days during the intervention period, including weekdays and weekends. The 11 days were selected to maximize opportunities for data collection (ie. busy days) and included between 1 and 3 observation periods per week. The observer used pre-defined rules based on time of arrival and seating location to select patrons to observe in an unbiased manner. Groups that arrived at a pre-specified time and whose picnic location was in close proximity to the observer were followed throughout their visit, or for up to 5 hours. When groups departed the observer used the same set of decision rules to select new groups to follow. Patrons were not aware that they were being observed.

Observations pertaining to each individual in the selected groups were recorded on purpose-developed and pre-tested forms, excluding pregnant women and children < 2

years of age. For each individual observed, the observer recorded her best estimation of their sex, age and weight status (non-overweight, overweight/obese, unsure). The observer used figural silhouettes for adults (9 for men, 9 for women) [26] and children (7 for boys, 7 for girls) [27] to assist in estimating weight status. Consumption of all foods/beverages was recorded. For each item consumed, the observer recorded details regarding the item (eg. brand, quantity, flavor), its source (eg. home, outside food establishment, pool concession), and portion size. For physical activity, the observer recorded the length of time that each person spent in and outside the pool and the total duration of their stay at the pool. Qualitative observations of a general nature were also recorded.

Quality assurance

Four joint observation sessions were held between the observer and the first author to provide corroboration, sensitize the observer to other potentially influential environmental factors, and provide opportunities for critical reflection. Patterns in the data and strategies to improve data collection were also identified.

10.2.3 Data analysis

10.2.3.1 Statistical analysis of sales data

A chi-square analysis assessed differences in the proportion of healthy and unhealthy items sold pre, during, and post-intervention, with the nutritional quality of menu items modeled as a categorical dependent variable (healthy/unhealthy). The main effect considered was treatment (pre-intervention, intervention, post-intervention). A chi-square analysis was also conducted to determine whether the proportion of total sales (ie. number of items sold) per pool patron and the proportion of total revenues per pool patron differed by treatment period for both concessions combined and for the municipally-operated concession.

Analysis of covariance was used to estimate differences between sales of healthy and unhealthy beverages, main dishes, and side dishes during the intervention period in the target concession. The dependent variable means were adjusted for the highest air temperature reached each day (Canadian National Climate Data and Information Archive), hours of operation, and the number of patrons at the pool. The number of adults was the only significant covariate. It was not possible to conduct this analysis for the municipally-operated concession, as there were too few healthy items sold within each menu type classification. All statistical analyses were performed using SAS (version 9.2; Cary, NC), with $p < 0.05$ denoting significance. Sales of individual items in the target concession were tabulated in Microsoft Excel, as low sales of several items precluded statistical analysis.

10.2.3.2 Observations

Dietary intake

Nutrition information was obtained from each concession, package labels, manufacturer's websites, the Canadian Nutrient File 2010 (Health Canada), and where necessary from Food Processor SQL (version 10.12.0; ESHA Research Inc., Salem, Oregon). This information was used to classify items as 'choose most often' (healthy), 'choose sometimes' (unhealthy), and 'choose least often' (unhealthy) according to the

standards in the Alberta Nutrition Guidelines for Children and Youth [25]. Quantification of nutrient intake was not possible as portion sizes were uncertain in most instances.

Physical activity

The proportion of each visit spent in the pool was determined by dividing the time spent in the pool by the total duration of the visit to the pool site. Means and standard errors of the total time spent at the pool site, and the proportion of each visit spent in the pool were calculated using SAS (version 9.2; Cary, NC). It was not possible to document each moment of activity for all individuals observed, and therefore there were some over/underestimates of time spent in and outside the pool compared to the total length of each individuals' visit. We added the number of minutes each individual spent in the pool to the number of minutes each person spent outside the pool and compared this value to the total length of the visit. This showed that the mean percentage of time that was over/underestimated was 9.8% of the total length of each visit, and therefore the impact of these discrepancies was small.

Qualitative observations of patrons' activities and behaviors in the setting were transcribed and analysed using thematic content analysis. Peer-debriefing served to verify the findings. To provide context for the quantitative findings, qualitative and quantitative observations were integrated during interpretation.

10.3 Results

10.3.1 Sales

The opening of the target concession led to an increase in the overall proportional availability of, and proportional sales of healthy items, followed by a decline when the target concession closed (Figure 10.1). The proportion of items sold that were healthy was significantly higher in the intervention phase compared to pre- and post-intervention ($p < 0.0001$). The proportion of the total items sold per patron and the proportion of the total revenues per patron did not differ across the 3 periods for both concessions combined, however both values declined significantly during the intervention period within the municipally-operated concession ($p < 0.001$).

Within the target concession itself, 44.4% of items available for sale were healthy, while 40.8% of those sold were healthy. Also within the target concession, sales of healthy beverages exceeded (unhealthy beverages, healthy and unhealthy side dishes, healthy main dishes) or were equal to (unhealthy main dishes) sales of all other product types (Figure 10.2, $p < 0.0001$). Fruit smoothies and slushes were responsible for the high sales of healthy beverages, accounting for 49.0% and 33.7%, respectively, of healthy beverage sales. Table 10.2 shows the items with the highest sales in each concession.

10.3.2 Observations

Patrons were primarily children accompanied by their parents. Parents exerted substantial control over children's eating, as they were generally the ones to initiate eating and to determine the range of choices offered. Children, however, were also influential in food-related decisions, as evidenced by discussions that occurred around

food. Children's attentiveness to eating varied substantially, some were excited about food, while others appeared uninterested and devoted their time to play.

Visits to the pool by children (n=132, 58% female, 4% overweight/obese) averaged 155 ± 5.5 minutes, while adults (n=92, 76% female, 39% overweight/obese) spent on average 138 ± 6.2 minutes at the pool. During their visit, patrons alternated between time spent in and outside the pool. Children spent approximately 57 ± 1.6% of their time in the pool and adults 42 ± 2.8 % (overall mean 54 ± 1.6%). The most common activities performed outside the pool were sedentary, including eating, sunbathing, reading and conversing. Almost all patrons ate at some point during their visit, and most ate intermittently throughout their visit. Most families packed a picnic lunch and supplemented with items from the concessions. The most popular items brought from home were sandwiches, fruit and potato chips. Thirty-seven percent of the items eaten were healthy items.

10.4 Discussion

This study was the first to assess the independent impact of food availability on sales of healthy items in a recreational sports setting with commercial food sales. Our results show that when few healthy foods were available their sales were low. However, when a variety of tasty and attractive healthy options were made available, healthy items sold in proportion to their availability, with no adverse effects on revenues. Thus, food availability was a potent and independent environmental determinant of food purchasing behaviors in this context.

Food availability has been described as one of the strongest predictors of dietary intake [28-31], however much of the evidence in support of this statement comes from individual-level surveys [32-35], focus groups [31, 34], ecological observational studies of the type and proximity of food stores in residential communities [36, 37], and studies of food availability within homes [3, 4] and schools [7, 38, 39]. The independent role of increased availability of healthier foods within community commercial settings in supporting their purchase and consumption is less certain, as although suggestive evidence is available from multi-component studies [40, 41], fewer have isolated the independent contribution of food availability to selection of healthier items. Our findings are in line with a small body of evidence that suggests a positive impact of increased availability of healthy items on their sale in community contexts [8-11]. Extension of previous work on food availability within homes and schools to the community and commercial sectors is critical because the health impact of interventions based in a single setting can be diminished by the absence of complementary supports in other environments [42].

Studies in other nations confirm that limited availability of healthy foods in sports settings is a problem with international relevance [16, 23, 43]. Availability of healthy items in sports settings is particularly critical for families, as time constraints associated with balancing parental work schedules with youth sporting activities may force families to purchase and consume meals in sports venues or from conveniently located fast food outlets [23, 44]. Parents of youth involved in sport report that many of the meals and snacks consumed by children in sports settings are unhealthy, and point to food

availability as one of the key factors that determines what their children eat in these settings [23]. Increasing access to healthier foods in these contexts may therefore positively influence the dietary consumption of families who, by virtue of their involvement in sport, may lack the time to prepare and consume healthy meals at home [44].

Remarkably, purchase of healthy items closely mirrored their availability throughout the study, a pattern also observed in some other investigations [9, 38, 45]. Increased availability was not sufficient to induce purchase of healthy items by all individuals however, as the majority of purchases remained unhealthy. It is not clear whether further increasing the availability of healthy items would have led to an even greater increase in their sale, as few studies have assessed this outcome. In one study, when availability of healthier snack foods in a hospital cafeteria was increased from 25% to 75% of items, their sales increased from 41% to 85% of items [8]. Whether such findings could be replicated in a community sports context is uncertain. Alternatively, increasing the availability of healthy items, while also limiting access to unhealthy items, might have encouraged more patrons to purchase them. Evidence indicates that when given a choice between healthy and unhealthy foods, individuals must simultaneously inhibit their desire to make an unhealthy selection and promote eating of the healthy item [46]. This is a difficult task, and indeed studies confirm that the likelihood of selecting healthy items decreases as the availability of tasty, less healthful options increases [8, 38, 47-54].

Food availability is only one of many factors that influence food selection. Even highly available junk foods do not sell themselves, and hence it is unlikely that food selection can be optimized merely by manipulating its availability. Important lessons for public health in increasing the sale of healthy items might be gleaned from examining the broad variety of tactics industry has employed to establish unhealthy items as the normative choice in most settings. In addition to altering food availability, future studies could manipulate food accessibility, and consider how these factors within physical environments interact with factors within social, political and economic environments to affect food choice in different settings. It is possible, for example, that in environments where physical access to food is unrestricted, that individual and social factors become more influential [55].

Managers in recreational sports settings contend that they do not provide many healthy foods because patrons do not purchase them [14, 20-22]. This study is the first to show that proportional sales volumes and proportional revenues per patron in these contexts can be maintained when the availability of healthy menu items is increased. This is a favorable outcome from a public health perspective because it suggests that patrons exchanged unhealthy for healthy items, avoiding the unintended consequence whereby individuals increase rather than reduce energy intake in response to various food-related interventions. These results are also favorable from an industry perspective because revenues did not decline. Thus, these findings demonstrate potential to establish mutually beneficial, health-promoting public-private partnerships in the recreational sports sector.

Although recreational sports settings are intended to promote wellness, the appropriateness of measures to increase availability of healthy foods within them is heavily contested. Our data challenge a popular assumption that changes to these food environments are not required because individuals are sufficiently active while there to offset any caloric indulgences [23]. Instead, observations from a subsample of patrons suggest that individuals were only in the pool for just over half of the approximately 2.5 hours they spent there. The metabolic equivalent for the primary type of activity observed in the pool, treading water with moderate effort, is relatively low at 3.5 [56]. [56]. Observers furthermore noted that individuals were largely inactive when outside the pool. The number of additional calories (ie. above resting values) burned at the pool may therefore have been relatively small. Findings are consistent with other studies showing that most of children's sports time is spent being sedentary or in light-intensity activities [57, 58]. Given that only 37% of items consumed by this subsample of patrons were healthy, it is possible that children may have consumed more calories at the pool than they expended while there. Studies suggest youth may overcompensate for increased physical activity by eating more [59]. Indeed, although youth sport participants would be expected to have lower body weights compared to their peers, they do not, perhaps due to higher energy, fast food and sugar sweetened beverage intakes [60]. If this energy gap does indeed exist, and persists over the long-term, it could lead to weight gain. Improving the food environment in recreational sports venues may therefore assist children to match energy intake with expenditures over the long-term.

Fruit smoothies (consisting of whole fruits, 100% fruit juice and low-fat dairy products) and slushes (consisting of whole fruits and ice) were the most commonly selected healthy menu items, and together accounted for nearly a quarter of all items sold in the target concession. Our data suggest that sales of smoothies and slushes displaced sales of unhealthy items in this setting, a finding of considerable importance given that intake of fruits, vegetables and dairy products is chronically low among Canadian children [61, 62]. Caloric beverages by contrast are popular, and account for 13-34% of the daily energy intake of Canadian children and youth [63]. Pre-adolescents, in particular, may prefer to consume fruit juices over whole fruits and vegetables [10]. Therefore, although their liquid medium may not be nutritionally ideal [64-66], because they are both nutrient rich (unlike sugar sweetened beverages), and well-liked (unlike many whole fruits and vegetables), beverages with healthful ingredients may be important vehicles for delivery of key nutrients lacking in children's diets. Ultimately, the health impact of these beverages will depend on how they are consumed, as any food consumed in excess of energy requirements can promote weight gain [64, 67]. Advice to offset calories from healthy beverages by consuming less of other (primarily unhealthy) items should therefore be emphasized.

10.4.1 Limitations

Although we did not directly evaluate change in food consumption, we did evaluate change in food selection, which has been shown to influence consumption [68]. Many of the healthy items on the target concession's menu were fruit-based. The determinants of fruit and vegetable intake differ substantially [69] and therefore findings may not be generalizable to sales of vegetables or other healthy foods not

included on the menu. Given the many factors that influence food selection, we cannot conclude that food availability was responsible for all of the observed outcomes, as other contextual features of the setting also contributed to sales of healthy items. For instance, although many popular unhealthy items were included on the menu (eg. grilled cheese sandwiches, hot dogs, ice cream cones), some very popular items were not, such as hamburgers and French Fries. Results may differ in other contexts according to factors such as alternative menu options available to patrons and may therefore not be generalizable. Nevertheless, these findings remain significant in that they demonstrate the potential to achieve such highly positive outcomes.

A novel aspect of this study was that time spent in activity was assessed via direct observation in a subset of patrons in a real-world context. Self-reports of energy expenditure were not used because it was not feasible to ask patrons to complete surveys in this setting. In addition, recall and reporting biases would have been substantial because children represented > 40% of patrons, and many were very young. Objective measures of physical activity such as accelerometers cannot be used in the water. Thus, although several assumptions were required in our analyses (ie. we assumed patrons were active in the pool and primarily inactive when outside the pool), we do not believe that other techniques of assessing physical activity were feasible or would have yielded better estimates. This analysis was illustrative in its intent and not meant to precisely quantify energy expenditure, therefore these findings should only be used in this manner. Future studies could employ additional observers to directly quantify the dietary intake of a large number of patrons and attempt to more precisely quantify energy expenditure.

10.5 Conclusions

The epidemic of obesity has made it abundantly clear that even well-intentioned, knowledgeable individuals can be influenced to make poor dietary choices by environmental factors operating outside of their conscious awareness. Individuals cannot make healthy choices if they are not available, and children in particular, are unlikely to do so in environments replete with unhealthy choices. Our findings suggest that increasing the availability of healthy items is a powerful means of positively influencing food selection in community commercial contexts. Increasing the availability of healthy foods is important because patrons may not be sufficiently active in some recreational sports settings to offset intake of energy-dense foods. Although necessary, increased availability of healthy items may not be sufficient to induce selection of healthy items however, as the majority of items sold remained unhealthy. Complementary measures should therefore be explored, such as targeted promotion of popular healthy items (eg. fruit smoothies and slushes), concurrent restrictions on availability of unhealthy items along with other types of supportive interventions.

Studies to date have primarily examined the impact of increased availability of healthier items within homes and schools on dietary intake. However, changes within schools and homes alone, without consideration of the broader context of unhealthy food environments that individuals encounter on a daily basis, will not be sufficient. Shifting the dietary behaviors of a large segment of the population in health promoting directions will require widespread environmental changes that influence people where

they live, work and play, such that healthier behaviors become normative in all settings. Findings from this study and others suggest that increasing the availability of healthier foods may be a potent mediator of healthier dietary behaviors with potential for broad applicability in multiple contexts.

10.6 Tables

Table 10.1 Nutritional rating of concession menus

	Target concession		Municipal concession	
	Healthy[a]	**Unhealthy**[a]	**Healthy**[a]	**Unhealthy**[a]
Main dishes	25.0%	75.0%	0%	100%
Snacks and desserts	50.0%	50.0%	3.7%	96.3%
Beverages	55.6%	44.4%	40.0%	60.0%
Total	44.4%	55.5%	9.1%	90.9%

[a]Healthy items met the definition of 'choose most often' in the Alberta Nutrition Guidelines for Children and Youth [25], unhealthy items met the definition of 'choose sometimes' and 'choose least often'.

Table 10.2 Top 10 items sold during the intervention period in each concession, items listed in order from highest to lowest sales

Target concession	Municipal concession[a]
Hot dog	Potato chips
Ice cream cone	Pixi sticks candy
Fruit smoothie	Snow cone
Fruit slush	Freezie
Grilled cheese sandwich	**Water**
Water	Soda pop (regular and diet)
Banana split	Drumstick ice cream
Feta chicken wrap	Maynards candy
Iced coffee	Ice cream sandwich
Teriyaki chicken wrap	Fudgesicle

Healthy items in bold

[a]The top 10 items sold during the pre and post-intervention periods was very similar to those sold during the intervention period in the municipal concession. The only meaningful difference was that water had the 4th highest sales during the pre and post-intervention periods.

10.7 Figures

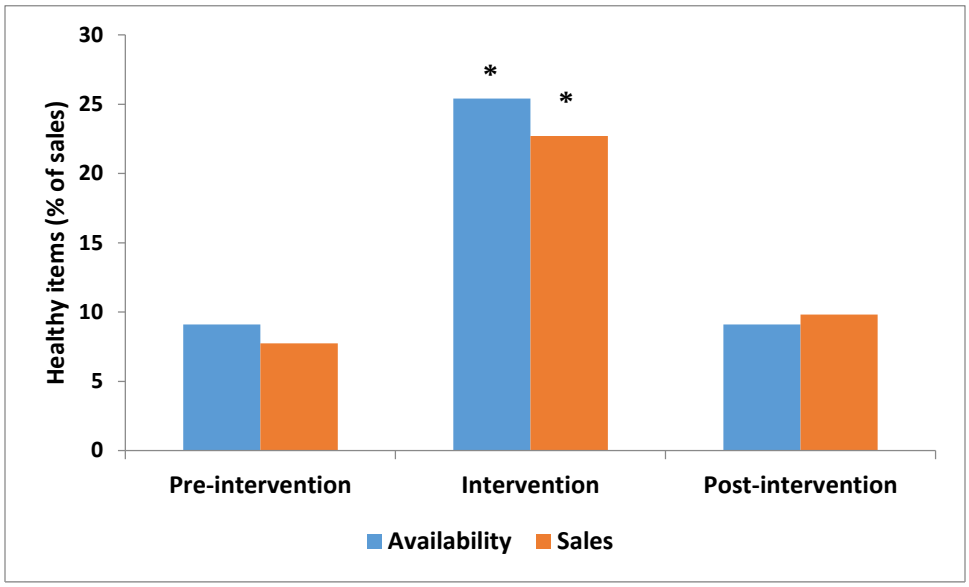

Figure 10.1 Comparison of availability and sales of healthy items.
*Significantly different from pre- and post-intervention, $p < 0.0001$

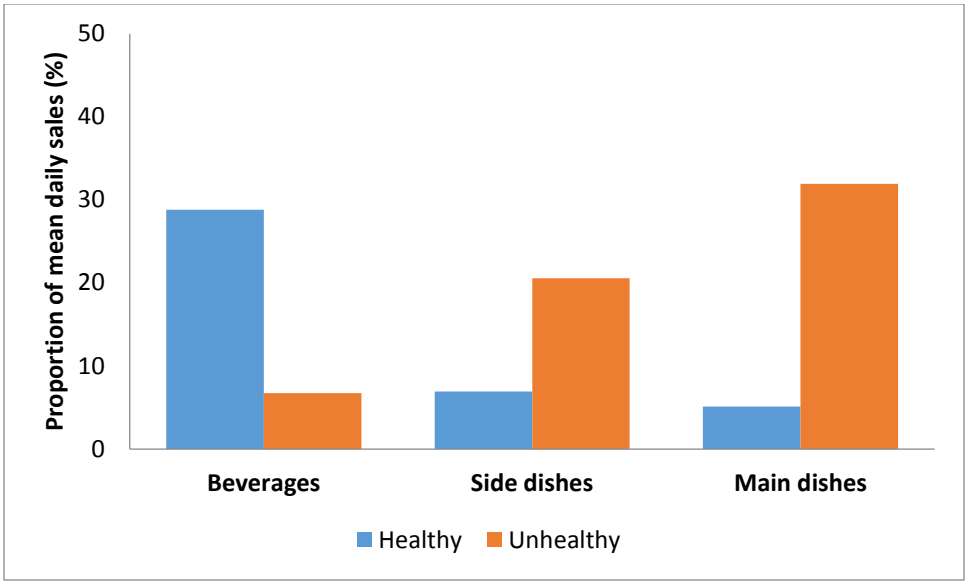

Figure 10.2 Sales according to product type during the intervention period

10.8 References

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CHAPTER 11: Discussion and conclusions

Portions of this chapter have been submitted for publication. Olstad DL. Unhealthy food environments in recreational sports settings: What's a government to do? Submitted to American Journal of Preventive Medicine.

11.1 General discussion

These findings in Alberta's recreational facilities add to the growing body of literature concerning the problem of the ubiquitous availability of unhealthy foods in recreational facilities and other sports settings. Consistent with findings in other provinces, these studies have demonstrated that recreational facilities in Alberta have unhealthy food environments [1, 2]. An appetite for change exists, however the motivation, resources and supports appear largely absent, and fears of reduced profitability prevail. Novel interventions in this setting increased sales of healthy items to varying degrees [3, 4], however the most appropriate and efficacious means of optimizing food purchases in recreational sports contexts remains unclear. This thesis has made a number of important theoretical and practical contributions to this literature:

1) Diffusion of voluntary nutrition guidelines is slow when they are disseminated in an atheoretical manner.
2) A supportive facility manager is essential for adoption and implementation of nutrition guidelines.
3) The primary barrier to adopting and implementing nutrition guidelines is financial.
4) A variety of complementary strategies will be needed to support sales of healthier items in recreational facilities, however increasing the availability of healthy foods is a particularly promising strategy.
5) Multi-sectoral partnerships are essential for adoption and implementation of nutrition guidelines in recreational facilities.
    a. Industry is willing to partner with recreational facilities to offer healthier foods, provided they can remain profitable.
    b. Partnerships with schools can provide vital implementation support.
6) In their current form, the ANGCY are unlikely to significantly improve recreational facility food environments and thus stronger guidelines/policies are needed.
7) Widespread voluntary uptake of the ANGCY appears unlikely. Mandated, resourced and enforced nutrition policies for recreational facilities should be introduced.

1) Diffusion of voluntary nutrition guidelines is slow when they are disseminated in an atheoretical manner.

The ANGCY have been promoted largely through passive dissemination strategies including mailing the ANGCY to municipalities, a website, and presentations at conferences [1]. The diffusion literature suggest such strategies are unlikely to succeed [5-7], and indeed, they have been relatively ineffective at stimulating widespread adoption of the ANGCY in Alberta's recreational facilities [1]. Diffusion theory provides a menu of validated strategies that can be purposefully applied to accelerate the spread of the ANGCY [8]. The CATCH experience illustrates the potential for widespread uptake

of nutrition standards when diffusion principles are strategically operationalized [6]. Specific strategies that might be used to accelerate the spread of nutrition guidelines among recreational facilities include the following:

a. Collecting sociologic data about potential adopters and the social system: Focus groups can be conducted with managers and other recreation stakeholders to collect information about the values, beliefs and needs of potential adopters, to understand the patterns of interaction among them, and to allow them to have input into the design of nutrition guidelines [8]. This information can be used to inform revisions to the guidelines, and will help to ensure the final guidelines are wanted, used and sustained [8]. Observations of the patterns of interaction among stakeholders can be used to optimize the design of dissemination strategies [8].
b. Emphasize positive attributes of the innovation: Perceived negative attributes of the ANGCY, such as their complexity, compatibility, relative advantage and observability have strongly dissuaded their uptake [2]. Strategies to improve uptake should therefore seek to improve these negative perceptions [9]. Managers might perceive the guidelines to be less complex if, for example, they had access to lists of compatible foods, sample menus and policies, and short instructional videos with step-by-step implementation strategies. Case studies of exemplary facilities could be presented and discussed in training sessions and at annual meetings, highlighting positive outcomes that were achieved.
c. Consider intervention clusters: Once an individual has adopted one innovation, the threshold for adopting other related innovations is typically lower [9]. Thus, recreational facilities that have adopted physical activity guidelines, a relatively less difficult prospect for the recreation sector, could be targeted for adoption of nutrition guidelines.
d. Conduct demonstration projects: Demonstration projects showcase an intervention in a manner that increases the likelihood of adoption by making an intervention attractive through demonstrating its positive outcomes [9]. In a subsequent study we will conduct a demonstration project to showcase the outcomes of adhering to the ANGCY.
e. Tap into societal sectors: Societal sectors are collections of focal organizations that operate in the same domain [9]. Members are typically linked in dense social networks that can be tapped into to accelerate diffusion [9]. The Alberta Recreation and Parks Association and Communities Choosewell are societal sectors that link Alberta's recreational facility managers. Their influence and communication channels could be leveraged to accelerate diffusion of nutrition guidelines through raising awareness about the problem of unhealthy food environments, endorsing the ANGCY, providing training sessions at conferences, disseminating resources, providing implementation support, and facilitating dialogue among members.
f. Target opinion leaders: Diffusion can be greatly accelerated by targeting a small subset of potential adopters who are informal leaders within the social system of interest [9]. Thus, to increase uptake of the ANGCY, efforts can focus on enlisting the support of recreational facility managers who are perceived as influential by their peers.

g. Allow adaptations: Innovations that are perceived to be adaptable to the local context are more likely to be adopted [10]. Adding additional components to interventions is less likely to dilute their effectiveness [11], and thus recreational facility managers can be encouraged to make these types of adaptations. Similarly, managers should be told which aspects of the nutrition guidelines are essential to effectiveness, and which are more peripheral to ensure useful adaptations [9].
h. Provide training: Training is a key predictor of diffusion success [12, 13]. Training sessions are crucial, not only for learning, but because they provide opportunities for potential adopters to interact, thereby activating interpersonal communication channels. Such sessions could be offered through webinars, through Communities Choosewell events, and at the Alberta Recreation and Parks Association's annual conference.

2) A supportive facility manager is essential for adoption and implementation of nutrition guidelines.

Facility managers are gatekeepers of the food environment in recreational facilities by virtue of their authority to adopt policy and direct resources toward their implementation [2]. In all cases of successful ANGCY adoption and implementation, managers were catalysts for the adoption decision and championed their ongoing implementation [2]. Efforts to improve recreational facility food environments must therefore target the beliefs, attitudes and knowledge of managers.

3) The primary barrier to adopting and implementing nutrition guidelines is financial.

A wide variety of factors ranging from managers' personal beliefs, to industry norms and food service contracts interacted to shape adoption and implementation of nutrition guidelines [2]. Financial factors, however, figured most prominently into food provision decisions, and frequently constituted an insurmountable barrier to adopting nutrition guidelines in this setting [2, 14]. Finances are also an important barrier to offering healthy foods in recreational facilities in other provinces [15-19]. The recreation sector requires evidence that selling healthier foods can be profitable. Such evidence is beginning to emerge, as according to the Hudson Institute [20], sales of lower calorie items account for a disproportionate share of sales growth within the food industry. Accordingly, it is possible that provision of healthier foods may actually prove financially beneficial for recreational facilities, however most are reluctant to test this possibility. We showed that selling healthier items does not, at minimum, adversely affect revenue [4], however stronger evidence is required over a longer period of time in a controlled pre-post assessment.

There appears to be a small subset of managers within the recreation sector who can be classified as 'innovators'. These managers recognize, and are responsive to market trends toward healthier eating and are willing to take small financial risks to remain on the leading edge [2]. These innovators might be persuaded to participate in demonstration projects to showcase the financial impact of adhering to nutrition guidelines, and several are, in fact, participating in such a project. By making 75% of the foods in one recreational facility healthier options, and applying behavioral economic

principles to incent their sale, we hope this project will show that selling healthier items can be a profitable venture, and to thereby encourage development and diffusion of nutrition policies within the recreation sector.

4) **A variety of complementary strategies will be needed to support sales of healthier items in recreational facilities, however increasing the availability of healthy foods is a particularly promising strategy.**

Some managers did not recognize the importance of making a wide variety of healthy foods available within recreational facilities, believing that providing a small number of healthier options was sufficient. Small changes do not appear to affect patrons' food purchasing behaviors in recreational contexts, however [16] and our findings suggest that healthier items sell in proportion to their availability [4]. These findings present a unique opportunity for managers; as instead of passively responding to market forces, managers can proactively generate demand for healthier items by making a greater variety of healthy, attractive items available, and promoting their sale. A section of the ANGCY should therefore be dedicated to explicating the importance of increasing the availability of healthy food, highlighting the important role of the manager as a nutritional gatekeeper, and providing recipes for popular healthy menu items and practical strategies to support their sale. Online videos and in-person training sessions would also be valuable in this respect.

Whether a specific 'dose' of healthy foods is optimal in this setting is unclear, as we did not assess this outcome. The environmental defaults were unhealthy (ie. < 50% 'choose most often' items) in all facilities examined, and sales reflected this reality [2, 4]. Studies in schools suggest that restricting availability of unhealthy items is efficacious [21, 22], but such studies have not ascertained the optimal ratio of healthy/unhealthy foods. While total elimination of unhealthy items might be appropriate in schools, it is less socially acceptable in sports settings, where adults may constitute a significant proportion of the population. A level of restriction appears necessary, however, as despite increased availability of healthy items, the majority of food purchases by adults and children alike were unhealthy [4]. Our findings therefore suggest that increased availability of healthy items is necessary, but not sufficient to ensure purchase of healthier items when unhealthy items are still available. Given that unhealthy items are unlikely to be completely eliminated from recreational facilities in the near term, additional measures will be needed to further improve food selection. Such measures might include restricting availability of unhealthy items, economic incentives, marketing or strong nudges. The potential to influence children's dietary behaviors through their sociocultural environments should also be explored. Coaches, in particular, exert significant influence over the lifestyle behaviors of children in their care, making them potentially important allies in efforts to improve children's dietary behaviors [23].

5) **Multi-sectoral partnerships are essential for adoption and implementation of nutrition guidelines.**

Multi-sectoral partnerships can provide recreational facilities with access to key knowledge, experience and resources they lack [2]. Two partnerships that proved particularly important in this series of studies were those with industry and with schools, described below.

a. Industry is willing to partner with recreational facilities to offer healthier foods, provided it can remain profitable.

The extent to which industry can play a constructive role in resolving the obesity crisis is disputed, however my work has highlighted several important points in this respect. It initially appeared that industry, by virtue of its focus on profitability, might pose a barrier to the use of nutrition guidelines in recreational facilities [1]. In-depth examination of this issue, however, proved this was not the case [2]. Instead, collaboration with the food sector proved essential to implementing the ANGCY, as in all cases of successful ANGCY implementation, health promoting partnerships with the private sector were formed [2]. These partnerships were important because recreational facilities lacked the food and guideline-related expertise that industry possessed. All managers from industry actually supported the ANGCY in principle [24], a phenomenon also observed in British Columbia [19]. What set adopters apart from non-adopters was therefore not their support for nutrition guidelines, but their willingness to sacrifice short-term profitability to remain on the leading edge of market trends toward healthier eating [24]. Non-adopters, by contrast, focused on short-term profitability and were unwilling to risk profit loss by offering healthier items [24]. The importance of partnering with industry was further substantiated in our final study where we showed that it is possible to collaborate with industry to increase the availability of healthy foods in recreational settings, with no adverse impacts on profitability [3, 4].

This series of studies has shown that industry is willing to [24], must [2] and can [3, 4] play a constructive role in improving recreational facility food environments. There are many barriers to working with industry, however, including the provisions of contracts, limited resources and training, competitive pressures, few ANGCY-compliant products within the marketplace and financial concerns [19, 24]. Profitability, in particular, will continue to be a major barrier, and thus it is unclear that industry will be willing to voluntarily make the transformative changes necessary in their product lines and marketing tactics to address obesity. Nevertheless, industry has much to contribute by way of resources and expertise and indeed, it is difficult to envision how effective solutions to obesity can be forged without their involvement. Meaningful social change will require constructive engagement between the public and private sectors [25, 26]. Government is ultimately responsible for putting the mechanisms in place to support health promoting public-private partnerships that will enable industry's food-related expertise to be harnessed for the public good.

b. Partnerships with schools can provide vital implementation support.

Many of the objections to improving school food environments are similar to those encountered in recreational facilities, such as the potential for lost revenue, the normative nature of unhealthy foods, and concerns that children will simply purchase unhealthy foods elsewhere [27, 28]. That many schools now have nutrition policies suggests schools may have overcome some of these barriers. It is important to translate these successes to other settings such as recreational facilities, to ensure children receive consistent messages and support for healthy eating in multiple venues. My findings demonstrate that efforts to improve school food environments supported

similar changes to recreational facility food environments through policy diffusion and access to the knowledge and experience schools had acquired in the course of implementing nutrition guidelines [2]. Collaboration with schools may therefore improve capacity to adopt and implement nutrition guidelines in recreational facilities.

6) **In their current form, the ANGCY are unlikely to significantly improve recreational facility food environments and thus stronger guidelines/policies are needed**.

The food environment in facilities that had adopted and implemented the ANGCY was not substantially healthier compared to the food environment in facilities that had not [1, 2, 14]. This might be due to the voluntary nature of the guidelines, as implementation of other voluntary nutrition guidelines has also produced small changes [16, 29]. This finding is also likely related to the ANGCY's use of weak, non-prescriptive language. Policies that use direct, prescriptive language to indicate which foods 'must' and 'must not' be made available are associated with better dietary behaviors and body weight outcomes in children compared to weaker policies that use terms such as 'should' [30-32], as the ANGCY do.

Furthermore, although the ANGCY include a robust food classification system, they lack specificity with respect to its application. This lack of specificity may limit managers' ability to implement the ANGCY's recommendations, as well as researchers' ability to monitor their implementation. For instance, the ANGCY indicate that healthier foods prepared with little to no added fat, sugar or salt should always be available, however they do not specify what proportion of items should be from each of the 3 food groups (ie. 'choose most often', 'choose sometimes', 'choose least often'). They furthermore recommend that healthier choices be competitively priced, convenient, attractively packaged and prominently displayed, however few details are provided regarding how to operationalize these concepts. Greater clarity would reduce the complexity of implementing the ANGCY for managers.

Therefore, to facilitate and improve ANGCY implementation, the ANGCY should be revised to include the following 3 components: 1) Strong, prescriptive language, 2) Clear specifications regarding the proportion of items permitted to be from each food group, and 3) Specific standards regarding the pricing, convenience, packaging and display of healthy and unhealthy items. Such standards will clarify objectives for recreational facilities and will facilitate evaluation of ANGCY implementation. Given the correspondence between food availability and purchasing behaviors, a final goal of a minimum of 50% 'choose most often' options and a maximum of 25% 'choose least often' options appears advisable, along with specific directions regarding how healthy foods are to be displayed (eg. ≥ 75% of shelf space must be dedicated to healthy items), packaged (eg. healthy items must be the default items in combo meals), priced (eg. healthy items must be ≤ in price to comparable unhealthy items) and how to make them more convenient (eg. ≥ 50% of healthy items are available in a 'grab-and-go' format). Future versions of the ANGCY should also address food marketing. In this respect, only 'choose most often' items should be advertised and permitted to occupy the most prominent positions at check-out counters and on shelves. 'Choose least often' options should be relegated to harder to reach shelves, not featured in displays, nor should they

be in the vicinity of cash registers. These revised, strengthened standards could be phased in over time to allow an adjustment period.

7) **Widespread voluntary uptake of the ANGCY appears unlikely. Mandated, resourced and enforced nutrition policies for recreational facilities should be introduced.**

Governments have a variety of policy tools at their disposal to assist recreational facilities to improve their food environments; ranging from relatively less to more coercive measures. Five paths appear evident to increase use of the ANGCY in recreational facilities. The government could: 1) Maintain the status quo, 2) Adopt an incentivized voluntary approach, 3) Attempt to catalyze voluntary diffusion of the ANGCY through strategic application of diffusion principles, 4) Require recreational facilities to develop their own wellness policies, or 5) Introduce mandatory legislation to regulate the food environment in recreational facilities.

Unhealthy diets and obesity create significant negative health, social and economic costs [33, 34]. Thus, strong decisive action to improve food environments appears justified in the best interests of the public's health. Because current approaches have yielded little progress over the past 5 years, the status quo appears unacceptable in recreational facilities. The second option proposes that the provincial government could attempt to encourage voluntary adherence through incentives, such as a guarantee to replace lost revenues for a period of time, or through tax breaks to companies that offer healthier products. Direct financial incentives from government have proven an effective means of incenting US schools to comply with stringent school nutrition standards [35]. Similar to pay-for-performance schemes in health care, governments could also incorporate guideline-related outcomes as performance accountabilities for recreational facilities to continue to receive a portion of their public funding. In Australia, health promotion foundations were established to provide replacement funding for sports and arts organizations that previously relied on tobacco sponsorships [36]. The foundations used these funds as leverage to promote development of policies supportive of healthy lifestyle behaviors within sports settings [36, 37]. Wellness Alberta has proposed the establishment of a Wellness Foundation that will invest in evidence-based actions to reduce the risk of chronic disease among Albertans [38]. As part of its mandate, the Foundation could provide sponsorship dollars to recreational facilities that agree to adhere to the ANGCY.

While an incentivized, voluntary approach to adopting the ANGCY might somewhat increase availability, marketing and purchase of healthier foods, given the market dominance of unhealthy foods, it is unlikely that governments can offer incentives substantial enough to motivate a near total transformation of recreational facility food environments, particularly if other sectors that have been asked to make similar changes, such as schools, do not receive similar supports. Small financial incentives provided to recreational facilities in British Columbia, for instance, while effective, resulted in only minor changes [16]. It may furthermore be impossible to offer incentives large enough to make production of healthier items financially advantageous, given well-entrenched consumer taste preferences and the small size of the recreation sector.

A third option to increase uptake of the ANGCY concerns strategic application of diffusion principles to accelerate their spread. Municipalities have often been the catalysts for public health change, testing and evaluating nutrition policies related to trans fats and menu labelling, with subsequent diffusion to other jurisdictions and levels of government [39]. Diffusion is a slow process, however, and is perhaps too lengthy given the urgency of the obesity crisis. In addition, although diffusion may increase adoption of the ANGCY, implementation may remain suboptimal, as it is in the current voluntary context [2]. It might be possible to increase adherence through holding recreational facility managers publicly accountable for implementation [39], using the media as a channel to highlight those facilities in compliance, and those that are not. Therefore, although innovative, and perhaps worth testing for a time, there are reasons to expect voluntary strategies will prove ineffective.

The fourth option provides a softer policy approach, suggesting the provincial government could require recreational facilities to develop their own local wellness policies. Although attractive because it allows communities to tailor policies to their local contexts, a similar approach taken by the US federal government in schools has had limited success, with tremendous variability in policy type, strength, comprehensiveness and implementation across the nation [40-43], and evidence that many of the policies that have been implemented have been weak [43-47]. Such a policy approach could have the unintended consequence of increasing disparities if better-resourced communities, which may already have lower obesity rates, implement stronger and more comprehensive policies. This concern might be partially ameliorated by establishing strong minimum standards, however this approach would then not differ substantially from a mandated, 'hard' policy approach.

Voluntary nutrition guidelines must always lack the potency of mandated policies, and we found little appetite for voluntary adoption of guidelines on the part of managers who perceived them to be incompatible with patron preferences and their own financial mandates [2]. Given the profound changes to the availability and accessibility of food within recreational facilities that will be needed to improve children's dietary behaviors in recreational settings, government regulation of these food environments appears essential. Policy has proven an effective means of improving food environments, and children's dietary behaviors and body weights in school contexts [21, 22, 48-60]. Nutrition policies in recreational facilities might yield similar outcomes, albeit with smaller effect sizes.

Such policies should be comprehensive to exploit their full potential, as the influences on dietary decisions are many, and will differ among individuals, contexts and according to time. Thus, as previously discussed, policies must address physical, economic and sociocultural aspects of recreational facility food environments. It is also important that nutrition policies for recreational facilities be balanced; founded in a strong evidence base, yet politically palatable and economically sound. To ensure a balanced approach, all stakeholders should be included in the process of policy development, including industry, as our results demonstrate that it can play a constructive role in improving recreational facility food environments [2]. Industry's economic concerns must not,

however, take precedence over health concerns. Developing conflict of interest guidelines with safeguards to protect policies from distortion by commercial interests might help in this respect [61, 62].

It will not be sufficient, however, to simply mandate adherence to nutrition policies. Recreational facility managers require training, resources and support to implement nutrition policies [2, 15, 16]. In the absence of such supports, resistance from managers is likely to be high and compliance suboptimal. Registered dietitians have played important roles in the development and implementation of the ANGCY and are ideally suited to assume these supportive roles [63]. Additional Health Promotion Coordinators could be hired to work exclusively with recreational facilities. Training for recreational facility managers and staff should also be provided through webinars and in-person sessions. It would be ideal if the provinces could partner together to leverage their collective strengths and resources, as provinces such as British Columbia and Ontario have made significant progress in this area. Importantly, all supports must be provided free of charge to facilities to ensure they are equally accessible by all. Policy enforcement will similarly be essential to ensure compliance, as implementation of even mandated nutrition policies has been suboptimal in several instances [64-67].

Industry representatives admit that voluntary adoption of the ANGCY is unlikely without a government mandate, and believe greater equity can be achieved through mandated policy [2, 24]. By levelling the playing field for healthy foods, mandated policy might therefore maximize societal gains by ensuring public health objectives are achieved without sacrificing economic prosperity. This expectation may be somewhat idealistic, however, as even if industry produces and markets healthier items within recreational facilities, its profit imperative requires it to always seek to encourage greater consumption of whatever it produces. From a weight-related perspective, the end result is the same. Caloric overconsumption leads to overweight and obesity regardless of whether individuals overconsume unhealthy, somewhat healthier, or healthy items. Supplementing policy and environmental measures with individual level education for coaches and youth about healthy eating might help to partially ameliorate this problem. Thus, the way forward under existing frameworks is somewhat uncertain, as even mandated policies may not enable simultaneous achievement of health and economic objectives within recreational facilities, and it may be necessary to accept partial goal attainment in both areas.

11.2 Challenges, needs, and unanswered questions

Policy research is complex and challenging. It is rarely feasible to conduct randomized controlled trials to evaluate policy impact, and thus a variety of study designs are required to evaluate policy. Attempts should be made to gather the highest quality data within these studies, however it is inevitable that compromises will be needed and study designs may not always be optimal. Given these challenges and the small number of studies that have investigated actual policy outcomes, a critique of current studies is unlikely to prove useful. Instead, I discuss gaps in the current evidence base.

It is clear that recreational and sports settings are sources of unhealthy foods, thus future studies in these settings should move away from problem identification towards

testing and diffusing innovative solutions. The following studies in recreational facilities should therefore be prioritized:

- Studies are needed to assess the extent to which improving the food environment in recreational facilities improves children's diets over the short and longer term. If children compensate for reduced availability of unhealthy foods in recreational facilities by adjusting their dietary behaviors in less healthful directions in other settings, then changes to recreational facility food environments may offer little benefit.
- Studies should continue to test strategies to increase the sale of healthy items in recreational settings, and should monitor their behavioral and economic outcomes.
- A controlled trial should be conducted in a large number of recreational facilities to assess the dietary, health and financial outcomes of adhering to the current ANGCY. Such a study could examine whether superior outcomes are achieved by adhering to stricter standards. A process evaluation could determine how the level of guideline implementation influences outcomes.
- An important challenge will be to establish a national nutrition standard to define what constitutes a healthy and an unhealthy food for application within recreational facilities, and to test its feasibility and ease of use.
- Determining the optimal proportion of healthy/unhealthy items that will be acceptable to patrons and that will optimize sales outcomes and dietary behaviors is an important area for future investigation.
- Studies should reassess the extent of ANGCY implementation among Alberta's recreational facilities at regular intervals and compare results to uptake of nutrition guidelines in other provinces such as British Columbia, that provide more supports for implementation.
- Diffusion studies should test the optimal means to diffuse nutrition policies among recreational facilities and to other sports settings.

It is generally agreed that effective approaches to unhealthy dietary behaviors and obesity will almost all be policy-led [68], and therefore broader policy studies outside of the recreation sector are also needed to determine which policies are effective, for whom, under what circumstances, and for how long. Application of ineffective policies is wasteful and potentially harmful if more effective interventions are neglected as a consequence [69].

Policy makers and researchers indicate that prior to implementing policy they especially require evidence regarding effectiveness, costs, appropriate delivery mechanisms, contextual factors, reach and adoption, and human, technical and organizational resources associated with particular policy options [70]. Research in these areas should therefore be prioritized. Individual studies cannot address all of these issues, however, and therefore these objectives could each be addressed at different stages of the policy development process [70]. During the efficacy stage of testing, demonstrating a causal link between a policy and particular outcomes should be paramount [70]. In the replication stage, research can focus on assessing the feasibility of promising policies in a variety of contexts, and can assess acceptability to stakeholders and costs associated

with the policy [70]. In the dissemination stage, emphasis can be placed on measuring the processes and factors that increase the reach and adoption of particular policies, and the moderating impact of local contexts [70]. At this stage it is also important to create and assess the infrastructure required to support policy [70]. To facilitate comparison of policy options, Gortmaker and Story [71] furthermore recommend that evaluations adopt a common metric such as an 'energy gap' model, expressing results in terms of kcals/day saved from a particular policy.

11.3 Implications

Unhealthy dietary behaviors and body weights have profound negative health and economic consequences for individuals, communities and societies. Given the established role of social and environmental factors in causing these problems, the way to reverse them will be to change the environment once again, through policy and environmental changes that support healthy behaviors [72]. Policy changes hold considerable promise for addressing unhealthy dietary behaviors and obesity because they create the default conditions for the sociocultural, physical and economic environments that shape individual health behaviors, have a broad reach, and are often equitable and cost-effective. A suite of complementary policies will be needed to achieve change on the scale needed to effectively address unhealthy dietary behaviors and obesity, including policies within and outside the health sector. Changes to recreational facility food environments are therefore but one aspect of a much larger obesity prevention policy framework that will be needed to engineer healthier environments.

Policy making is admittedly a controversial and complex endeavor. Current food environments are the product of a myriad of policies enacted over several decades [39]. Thus, it may take decades to reverse these policies and establish communities where healthy eating is normative [39]. The timelines for, and difficulty of change, and the large number of potential points of intervention can create a 'policy cacophony' that stifles action [73]. These challenges do not justify failure to introduce the politically difficult legislation that will be required to protect the health of society's most vulnerable citizens, however, if healthier choices are to become easier choices for the public, then healthier policy choices must be made easier for policymakers as well [74]. Just as obesity is a consequence of individuals responding 'normally' to their obesogenic surroundings [68], so too do these obesogenic environments arise because policy makers are making choices consistent with their political contexts [68]. Thus, policy makers do not bear sole responsibility for enacting healthy public policy. Lay citizens, health professionals and civil society organizations have a role to play in creating a supportive political context for healthy public policy through strategies such as advocating for policy change and holding government and industry accountable for their actions. Researchers can also contribute through conducting policy-relevant research, while industry can curb its unhelpful lobbying activities.

Policy, however, is not a panacea capable of eradicating poor dietary behaviors and unhealthy body weights from the Canadian population. Opportunities for intervention are numerous, and thus policies of various types must be complemented by interventions at individual, social and organizational levels in an ecological approach.

The commitment and cooperation of all sectors, and ultimately of all of society will be required to improve children's dietary behaviors and body weights. Government will inevitably be required to lead and coordinate these efforts, and will be challenged to negotiate the tension between economic and health concerns to ensure that profit does not trump public health.

11.4 Conclusions

Recommendations for obesity prevention suggest that children visit recreational facilities to participate in physical activities [75]. Parents who are trying to adhere to these recommendations by enrolling their children in sports may, however, inadvertently increase their children's risk of obesity through exposure to unhealthy food environments. Findings from this series of studies highlight the need to improve the food environment in recreational facilities, and the opportunities for doing so. Given that voluntary uptake of the ANGCY has been limited, a policy push appears necessary to ensure recreational facilities support and do not undermine child health through unhealthy food environments. By ensuring access to healthier foods within recreational facilities, such policies can augment the positive benefits of sport for child health, and improve the dietary intake of families who, by virtue of their involvement in sport, may lack the time to prepare and consume healthy meals at home.

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