

FOOD POLICY IN RECREATION AND SPORT FACILITIES IN CANADA: LESSONS LEARNED FROM EAT, PLAY, LIVE

by

M. Susan Caswell

A thesis

presented to the University of Waterloo

in fulfillment of

the thesis requirement for the degree of

Doctor of Philosophy

In

Public Health Sciences

Waterloo, Ontario, Canada, 2025

© M. Susan Caswell 2025

EXAMINING COMMITTEE MEMBERSHIP

The following served on the Examining Committee for this thesis. The decision of the Examining Committee is by majority vote.

External Examiner	Dr. Hassan Vatanparast Professor College of Pharmacy and Nutrition/School of Public Health University of Saskatchewan
Supervisor	Dr. Rhona M. Hanning Distinguished Professor Emerita School of Public Health Sciences University of Waterloo
Internal Member	Dr. Scott T. Leatherdale Professor; University of Waterloo Research Chair School of Public Health Sciences University of Waterloo
Adjunct Member	Dr. Patti-Jean Naylor Professor Emerita School of Exercise Science, Physical and Health Education University of Victoria
Internal-external Member	Dr. Leia M. Minaker Associate Professor School of Planning University of Waterloo

AUTHOR'S DECLARATION

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

STATEMENT OF CONTRIBUTIONS

The published manuscript presented in this thesis is the work of Susan Caswell, in collaboration with co-authors.

Exception to sole authorship:

PUBLISHED MANUSCRIPT

1. M. Susan Caswell, Patti-Jean Naylor, Dana Lee Olstad, Sara F.L. Kirk, Louise C. Mâsse, Kim D. Raine, Rhona M. Hanning (2021). Recreation facility food and beverage environments in Ontario, Canada: An appeal for policy. *International Journal of Environmental Research and Public Health*. 18, 8174. DOI: 10.3390/ijerph18158174.

As lead author of this chapter, I was responsible for carrying out data collection and analysis. Dr. Rhona Hanning and Dr. Patti-Jean Naylor provided guidance on conceptualization and direction during each step of the research. Co-authors provided feedback on draft manuscripts.

PUBLICATIONS IN PROCESS AT TIME OF DEFENCE

2. M. Susan Caswell, Patti-Jean Naylor, Dana Lee Olstad, Sara F.L. Kirk, Louise C. Mâsse, Kim D. Raine, Rhona M. Hanning
Do support factors for implementing voluntary nutrition guidelines affect the healthfulness of recreation and sport facility food environments? Experience across three Canadian provinces.
3. M. Susan Caswell, Patti-Jean Naylor, Dana Lee Olstad, Sara F.L. Kirk, Louise C. Mâsse, Kim D. Raine, Rhona M. Hanning
Lessons learned from a capacity-building intervention to support voluntary provincial nutrition guideline implementation in Canadian recreation and sport facilities: A multiple-case study.
The manuscript for this study is planned to be an abridged version of the Chapter content presented herein.

ABSTRACT

BACKGROUND

The advent of voluntary nutrition guidelines for municipally funded recreation and sport facilities in three Canadian provinces presented the opportunity to evaluate both policy impact and implementation support approaches. The current research extended the Eat, Play, Live (EPL) trial which examined food environments within recreation and sport facilities in the three nutrition guideline provinces (British Columbia, Alberta, Nova Scotia), with and without a capacity-building intervention (CBI), and a non-guideline control province (Ontario).

RESEARCH OBJECTIVES

1. Describe recreation and sport facility food environments in the absence of provincial nutrition guidelines.
 - a. Assess the healthfulness of food and beverages offered for sale and vending sales within a convenience sample of recreation and sport facilities in Ontario, Canada and compare between the cohort with a municipal policy banning the sale of water in single-serve plastic water bottles in municipally funded facilities versus the cohort without such a policy.
2. Explore components of the CBI that had the greatest impact on the healthfulness of food environments within recreation and sport facilities in nutrition guideline provinces randomized to receive the EPL CBI.
 - a. Examine the relationships among the implementation factors: guideline mobilization, facility context, and facility-level policy, and changes to the

- healthfulness of the food environment in facilities within nutrition guideline provinces randomized to receive the CBI; and
- b. Describe and frame relationships between and among CBI components and changes to the healthfulness of recreation and sport facility food environments using the updated Consolidated Framework for Implementation Research (CFIR) [1].

METHODS

Study 1: Ontario Recreation and Sport Facility Food Environment

Cross-sectional descriptive data on the food environments in municipal recreation and sport facilities in Ontario were collected on two occasions; time 1 (T1) and time 2 (T2), marking the start and end of the 18-month CBI. Differences in the healthfulness of food and beverages between facilities with and without a bottled water ban were measured using:

- a) Vending and concession packaged product profiles assessed by classifying healthfulness of each according to established British Columbia Ministry of Health Guidelines as *Sell Most*, *Sell Sometimes*, and *Do Not Sell* [2];
- b) Concession food environments scoring as measured using the Nutrition Environment Measures Survey-Restaurant reduced item audit (rNEMS-R) Fast Casual and Fast Food Summary [3]; and
- c) Itemized sales data for vending products targeting a two-week period around facility audits.

Descriptive statistics were calculated and differences between the two groups compared using Student's two-sided *t*-test.

Study 2: Guideline Implementation Factors and Changes in Facility Food Environment

In facilities across three voluntary nutrition guideline provinces (British Columbia, Alberta, Nova Scotia) that had been randomized to the EPL 18-month CBI, a qualitative comparative analysis (QCA) examined relationships between implementation factors: guideline mobilization (Mobilization), facility context (Context), and facility-level policy (Policy), and positive (healthier) food environment changes. Regression analysis was also used to examine the strength of relationships between the implementation factors and changes to healthfulness. Implementation factor ratings (low [1], low-moderate [2], moderate [3], moderate-high [4], high [5]) from a cross-case analysis, with each facility acting as an independent case, were used to conduct both the QCA and regression analyses. Facility healthfulness was assessed as described for Study 1. For the QCA positive change was defined as a decrease in the proportion of *Do Not Sell* products for vending and concession packaged beverages and snacks and as an increase in score for rNEMS-R Fast Summary scores. The ratings for the implementation factors were based on indicators for guideline mobilization, (the number and intensity of CBI activities implemented, access and use CBI of resources), facility context (training/expertise, priorities, structural characteristics, partnerships, champion and staff changes) and facility-level policy (quality, status and breadth) that were extracted from a range of data sources:

- a) An implementation summary for each facility was created by EPL provincial coordinators which included the following documentation:
 - a. Implementation plans documenting goals, tasks, responsibility, and timeline according to operational area (e.g., vending);

- b. Mobilization summaries documenting activities, intensity of activities and access and use of EPL resources;
- c. Context summaries documenting relevant context changes (e.g., food service contractor changes);
- d. Technical support provided;
- e. Regional teleconference minutes;
- f. Interview transcripts of intervention mid-point and end-point interview with facility representatives (CBI facility Leads);
- g. Provincial coordinator documentation around role and engagement of CBI facility Leads, buy-in, and major challenges and facilitators;
- h. A facility level policy assessment using purpose-built questions integrated in a self-assessment audit tool adapted to the recreation and sport facility context and available documents on facility-level policy or policies.

Study 3: EPL CBI Multiple-case Evaluation Framed by CFIR

A multi-case study approach was used to examine the impact and strategy variation of the CBI across different facility contexts. Two facilities who achieved greater success at increasing the healthfulness of the recreation and sport facility food environment (as a proxy for provincial nutrition guideline uptake/implementation) were compared and contrasted with two facilities that were less successful at effecting change. The updated CFIR [1] was used to frame the analysis. The selection of case facilities from the 17 receiving the CBI was based on facility rankings for nine food environment outcomes assessed through facility audits (as outlined for Study 1) at baseline (T1) and end-of-study (T2).

RESULTS

Study 1: Ontario Recreation and Sport Facility Food Environment

Packaged snack and beverage offerings available in vending machines and at concessions were predominantly *Do Not Sell* and rNEMS-R scores were well below ideal across the 16 participating facilities. Packaged snacks ranged from 94-96% *Do Not Sell* in facilities that allowed the sale of bottled water (n=8) and similarly from 87-94% in facilities banning bottled water (n=8). Beverages ranged from 74-77% *Do Not Sell* in facilities that allowed the sale of bottled water and differed significantly ($p<0.05$) from the 87-88% *Do Not Sell* in facilities banning bottled water. rNEMS-R Fast Casual scores were similar at 6.1 and 7.1 for facilities allowing bottled water versus those banning its sale, compared to an ideal score of 48.

Mirroring availability, sales from vending snacks and beverages were also predominantly *Do Not Sell*. Differences were found for beverage availability and sales between facilities in jurisdictions banning bottled water and those that allowed the sale of bottled water. The proportion of *Do Not Sell* beverages available was significantly ($p<0.05$) higher in the absence of bottled water (90% versus 79%) and the proportion of *Sell Most* (0% versus 14%) was significantly ($p<0.05$) lower in bottled water banned versus allowed facilities. This significant difference ($p<0.05$) was also reflected in the proportions of sales dollars for each category with 80% *Do Not Sell* and 14% *Sell Most* where bottled water was allowed compared to 91% *Do Not Sell* and 0% *Sell Most* in those facilities with a ban.

Study 2: Guideline Implementation Factors and Changes in Facility Food Environment

A breakdown of indicators that informed ratings for each guideline implementation factor and examples corresponding to higher ratings were provided.

QCA Results

QCA findings indicated that configurations with implementation factor ratings for each of Mobilization, Context and Policy indicated that higher levels were necessary to effect positive change in healthfulness outcomes. While high (5) ratings of each factor invariably resulted in positive change, there were various factor combinations of high (5), moderately-high (4) and moderate (3) factor ratings that were sufficient. Overall, somewhat higher ratings for Mobilization than the other two factors emerged in all successful configurations.

Regression Analysis Results

For Vending Beverages and Snacks, multiple regression analysis indicated that the three factors in the model: Mobilization, Context, and Facility-level Policy, were each significantly associated with a decrease in the proportion of *Do Not Sell* products. No significant associations with guideline implementation factors were found for beverage and snack proportions of *Do Not Sell* items within concessions nor for rNEMS-R Fast Summary scores.

Study 3: EPL CBI Multiple-case Evaluation Framed by CFIR

The facilities that emerged as 'More' (n=2) and 'Less' Successful (n=2) in improving the healthfulness of food offerings were, in each case, from British Columbia and Alberta. Each had made some positive changes across the multiple outcomes. Comparing and contrasting the More and Less Successful facilities across 49 constructs and sub-constructs of CFIR [1], 24 were distinguishing, 23 were not distinguishing and two were mixed. In particular, the More Successful facilities stood out for leveraging partnerships with local public health Registered Dietitians (Relational Connections, Implementation Facilitators), navigating resistance to nutrition guidelines and pushing for change (Tension for Change), accessing resources and

utilizing EPL provincial coordinator support (Communication and Access to Knowledge & Information) and taking action toward improving healthfulness of the facility food environment (Planning, Tailoring Strategies, Engaging, Doing).

CONCLUSIONS BY STUDY

Study 1: Ontario Recreation and Sport Facility Food Environment

In the absence of provincial nutrition policy/guidelines, most food and beverage offerings in participating facilities in Ontario were energy-dense and nutrient-poor, a finding mirrored in vending sales. Moreover, the healthfulness of the food environment was found to be vulnerable to unintended consequences of municipal-level policy. In jurisdictions that banned the sale of water in single-use plastic bottles offerings and sales of *Do Not Sell* beverages were proportionately higher than in facilities permitting bottled water. Moving forward, newer environmentally sustainable packaging options may provide a way for both health and sustainability goals to be met. Ironically, this finding demonstrated the power of mandated policy to alter food environments. Given that the food environment in facilities participating in the EPL study remained largely unhealthy even in provinces with voluntary nutrition guidelines [4], a mandated nutrition policy approach is recommended for Ontario moving forward. This would ensure that municipally-run facilities align with public health guidance by shifting the nutrition healthfulness of foods offered for sale. Ultimately, this would support the overall health of those enjoying recreation and sport facilities in Ontario.

Study 2: Guideline Implementation Factors and Changes in Facility Food Environment

The EPL trial found that recreation and sport facilities exposed to a capacity building intervention were better able to improve the availability of healthy foods in response to voluntary provincial nutrition guidelines than those without these supports [4]. This research aimed to determine the elements of the intervention that were most helpful. Higher ratings (moderate and above) in all three implementation factors (Mobilization, Context and Facility-level Policy) were necessary to support changes in recreation and sport facility food environments indicating implementation support approaches must include attention to all three to effect change. For Mobilization, ratings of moderately-high or high were necessary, suggesting that efforts supporting the number and intensity of mobilization activities such as monitoring and enforcement of existing food service contracts and food choice architecture approaches (e.g., positionality, cueing, changing default options) could have an impact on food environment healthfulness. Yet, Mobilization activities did not happen in isolation. Context and Policy were also necessary at moderate or moderately-high levels in combination with the higher Mobilization ratings and played a pivotal role in supporting mobilization activities; thus, attention to strategies focused on context elements (e.g., training, expertise, priority issues, structural barriers, partnerships) and facility-level policy development (e.g., food service contracts with healthfulness provisions) are critical.

Study 3: EPL CBI Multiple-case Evaluation Framed by CFIR

Use of the CFIR [1] to evaluate the CBI allowed identification of areas to direct future implementation support action to optimize nutrition guideline uptake in the municipally funded recreation and sport facility setting. The CBI training, support and resources of EPL enhanced

capacity for nutrition guideline implementation and facilitated positive change in the healthfulness of foods offered. Change is difficult and some barriers were outside the control of facilities, yet all study facilities benefited to some degree from the suite of supports available and made some positive changes in enhancing the healthfulness of food environments. The More Successful facilities benefited particularly from partnerships and relationships. EPL provincial coordinators, public health dietitians, and support communities were among the relationships that facilitated their greater success. Effective engagement and ongoing communications were fundamental to those relationships.

In order to foster meaningful change to the healthfulness of recreation and sport facility food environments, the current research points to the following recommendations for provinces or other jurisdictions instituting nutrition guidelines/policy: invest in dedicated and on-going expert implementation support; establish mechanisms for an on-going community of practice among those implementing guidelines; define clear steps in the progression towards full implementation of nutrition targets; develop comprehensive tools and resources to support revenue concerns and financial viability of the transition to healthier options for food service providers and facilities; create public messaging and setting-specific education campaigns to emphasize the value of healthy eating; and mandate provincial nutrition policy and assign accountability for implementation and monitoring within the regulatory framework.

THESIS CONCLUSIONS AND CONTRIBUTIONS

The research in this thesis has direct applicability to jurisdictions looking to implement recreation and sport facility food and nutrition guidelines/policy. Findings from the province of

Ontario with Study 1 clearly identified that in the absence of policy the recreation and sport facility food environment is unhealthy. Moreover, findings also indicated that a lack of policy could make facilities vulnerable to local policies that do not consider public health impact, as was the case with the plastic bottled water ban. The EPL trial demonstrated that in the absence of capacity building supports, voluntary nutrition guidelines did little to change the healthfulness of recreation and sport facility food environments [4]. Studies 2 and 3 of this thesis research took advantage of the capacity building intervention of EPL in identifying and evaluating implementation supports that could make the most difference to nutrition guideline uptake. Study 2 demonstrated that a combination of factors were required at high to moderate levels; importantly, Mobilization required even higher levels than the factors Context or Facility-level Policy. This suggests that prioritizing such guideline mobilization strategies could improve implementation outcomes. In comparing most and least successful intervention facilities using the CFIR implementation framework, Study 3 identified points of action for implementation support. The structure provided with the use of CFIR increases transferability of the research to other settings. Jurisdictions increasingly recognize the paradox of recreation and sport facilities supporting active living yet providing unhealthy food and beverages. The lessons learned from this research can support meaningful change in recreation environments. There are many, including CBI facility leads involved in the current research, that feel that nutrition policy for recreation and sport facilities should be mandated and not limited to voluntary guidelines. Certainly, the findings of this thesis research indicate that strong supports for the process of policy of guideline implementation are needed for meaningful change.

Ultimately, these changes could make recreation and sport facilities healthier food environments.

Contribution

This research contributes to current understanding of population-level policy implementation in community settings and can support policy planning, development, the implementation process and evaluation. The novel use of QCA analysis allowed a better understanding of the complexity and inter-relationship among factors influencing nutrition guideline implementation. The updated CFIR allowed identification of key factors influencing nutrition guideline implementation and extends our understanding of the application of implementation science in public health.

ACKNOWLEDGEMENTS

First and foremost, I want to thank my supervisor, Dr. Rhona Hanning for her guidance, encouragement, support and patience. It has been a privilege to work with you, and I consider myself truly blessed to have had this opportunity. Thank you Rhona!

To Dr. PJ Naylor, thank you! The insight, feedback and expertise you so generously shared during the course of this journey were invaluable.

To Dr. Hanning's lab group, I am so grateful for the on-going support over the years and friendships that developed. Working alongside such a fantastic group of researchers has been an honour and has truly enriched this experience for me.

To my committee members Dr. Leia Minaker, Dr. Scott Leatherdale and Dr. Hassan Vatanparast, thank you for the feedback, insight and expertise you provided to support and strengthen my work.

To my family and friends, thank you for your continuous encouragement, understanding and support!

Last, but certainly not least, I would like to acknowledge and thank my husband Alan Caswell, whose unwavering support, encouragement, faith in me and endless patience saw me through this journey. Thank you, I could not have done this without you!

TABLE OF CONTENTS

Examining Committee Membership	ii
Author's Declaration	iii
Statement of Contributions	iv
Published Manuscript	iv
Publications in Process at Time of Defence	iv
Abstract	v
Background	v
Research Objectives	v
Methods	vi
Study 1: Ontario Recreation and Sport Facility Food Environment	vi
Study 2: Guideline Implementation Factors and Changes in Facility Food Environment	vii
Study 3: EPL CBI Multiple-case Evaluation Framed by CFIR	viii
Results	ix
Study 1: Ontario Recreation and Sport Facility Food Environment	ix
Study 2: Guideline Implementation Factors and Changes in Facility Food Environment	ix
Study 3: EPL CBI Multiple-case Evaluation Framed by CFIR	x
Conclusions by Study	xi
Study 1: Ontario Recreation and Sport Facility Food Environment	xi
Study 2: Guideline Implementation Factors and Changes in Facility Food Environment	xii
Study 3: EPL CBI Multiple-case Evaluation Framed by CFIR	xii
Thesis Conclusions and Contributions	xiii
Contribution	xv
Acknowledgements	xvi
List of Figures	xxii
List of Tables	xxiii
List of Abbreviations	xxiv
1 Introduction	1
1.1 Context	1
1.2 Key Literature	2
1.2.1 Why is healthy eating important?	2
1.2.2 Does the food environment matter?	2

1.2.3	What does the recreation and sport facility food environment look like?.....	3
1.2.4	Why consider policy as an intervention?	4
1.2.5	The state of recreation and sport facility food policy in Canada	5
1.2.6	What does food policy implementation look like in the recreation facility setting?.....	6
2	Specific Aims	7
2.1	Rationale	7
2.2	Research Objectives.....	8
3	Methods.....	9
3.1	Preamble.....	9
3.2	Eat, Play, Live	9
3.2.1	Study Design.....	9
3.2.2	Eligibility Criteria	9
3.2.3	Recruitment	10
3.2.4	Data Collection & Measures	10
3.2.5	Analysis	15
3.2.6	Ethics Approval	15
4	Recreation Facility Food and Beverage Environments in Ontario: An Appeal for Policy.....	16
4.1	Preamble	16
4.2	Introduction	17
4.3	Materials and Methods.....	20
4.3.1	Study Design.....	20
4.3.2	Recruitment	20
4.3.3	Data Collection and Measures	21
4.3.4	Analyses	23
4.3.5	Ethics Clearance and Consent.....	23
4.4	Results.....	23
4.4.1	Participating Facilities	23
4.4.2	Site Audits	25
4.4.3	Vending Offerings	26
4.4.4	Concession Packaged Food, Beverages, and Point-of-Purchase Offerings.....	26
4.4.5	Concession Menus and Food Environment	27
4.4.6	Vending Sales	29
	Discussion.....	31

4.4.7	Facility Food Environment	31
4.4.8	H ₂ O vs. H ₂ O Ban	32
4.4.9	A Call for Nutrition Policy	34
4.5	Strengths and Limitations	38
4.6	Conclusions	39
5	Do Support Factors for Implementing Voluntary Nutrition Guidelines Affect the Healthfulness of Recreation and Sport Facility Food Environments? Experience Across Three Canadian Provinces.....	40
5.1	Introduction	40
5.2	Methods.....	45
5.2.1	Capacity-building Intervention (CBI).....	45
5.2.2	Data Sources/Measures	45
5.2.3	Analysis	47
5.3	Results.....	52
5.3.1	Implementation Factor Ratings in Relation to Positive Changes in Food Healthfulness using Qualitative Comparative Analysis (QCA)	55
5.3.2	Implementation Factor Ratings in Relation to Positive Changes in Food Healthfulness using Regression Analysis	59
5.4	Discussion.....	64
5.4.1	Guideline Mobilization.....	65
5.4.2	Facility Context.....	68
5.4.3	Facility-level Policy	72
5.4.4	Strengths & Limitations.....	73
5.5	Conclusions	74
6	Lessons Learned from a Capacity-building Intervention to Support Voluntary Provincial Nutrition Guideline Implementation in Canadian Recreation and Sport Facilities: A Multiple-case Study.....	76
6.1	Introduction	76
6.2	Methods.....	79
6.2.1	Sample.....	79
6.2.2	Capacity-building Intervention (CBI).....	81
6.2.3	Data Profile	81
6.2.4	Analysis	82
6.3	Results.....	85
6.3.2	I: Innovation Domain.....	87
6.3.3	II: Outer Setting Domain	89

6.3.4	III: Inner Setting.....	90
6.3.5	IV: Individuals Domain: Roles Subdomain	104
6.3.6	IV: Individuals Domain: Characteristics Subdomain	108
6.3.7	V. Implementation Process Domain	111
6.4	Discussion.....	130
6.4.1	The Revenue Conundrum	130
6.4.2	Relationships are Critical.....	134
6.4.3	Actioning Change	138
6.4.4	CFIR as a Guiding Framework	143
6.4.5	Strengths and Limitations	144
6.5	Conclusion.....	147
6.5.1	Summary Recommendations.....	147
7	Conclusion.....	149
7.1	Overview	149
7.2	Summary of Key Findings.....	151
7.2.1	Study 1: Ontario Recreation and Sport Facility Food Environment.....	151
7.2.2	Study 2: Guideline Implementation Factors and Changes in Facility Food Environment.....	152
7.2.3	Study 3: EPL CBI Multiple-case Evaluation Framed by CFIR.....	152
7.3	Discussion.....	153
7.3.1	Mandated Nutrition Policy.....	154
7.3.2	Policy Implementation Process.....	156
7.3.3	Broader Health Policy Approaches	161
7.4	Limitations.....	163
7.5	Scholarly Contributions and Recommendations for Future Research and Practice.....	164
	References	166
	Appendix A: Facility-level Policy Assessment	183
	Facility Representative Assessment Questions	183
	EPL Scoring Guidelines	183
	Appendix B: Facility Context Data Summary	186
	Appendix C: EPL Capacity Building Intervention.....	187
	Appendix D: Interview Guide	189
	Facilities randomized to CBI.....	189
	Mid-intervention Interview.....	189

Follow-up Interview	189
Non-intervention facilities	190
Appendix E: Cross-case Analysis Team Ratings/Scoring	191
Appendix F: Study 3 Analysis Summary	192

LIST OF FIGURES

- Figure 4.1: rNEMS-R Fast Casual mean facility score according to H₂O and H₂O Ban
- Figure 4.2: rNEMS-R Fast Food mean facility score according to H₂O and H₂O Ban
- Figure 5.1: Framework illustrating theoretical relationships between CBI implementation indicators, guideline implementation factors, guideline implementation level, and change in the food environment
- Figure 6.1: Consolidated Framework for Implementation Research (CFIR) adapted from Damschroder 2022

LIST OF TABLES

Table 4.1:	Facility characteristics according to H ₂ O and H ₂ O Ban policy conditions
Table 4.2:	Packaged food and beverages: mean proportion of offerings according to H ₂ O and H ₂ O Ban policy conditions
Table 4.3:	Concession menu offerings according to H ₂ O and H ₂ O Ban policy conditions
Table 4.4:	Vending sales according to H ₂ O and H ₂ O Ban policy conditions
Table 5.1	Facility characteristics at EPL baseline
Table 5.2	CBI indicators for guideline implementation factor rating
Table 5.3	Qualitative Comparative Analysis (QCA) examining implementation factor ratings in relation to positive change in food environment healthfulness measures
Table 5.4	Multiple Regression analysis examining relationships between implementation factors and proportional change in food environment healthfulness measures
Table 5.5	Bivariate Regression analysis examining relationships between Implementation Score and proportional change in food environment healthfulness measures
Table 6.1	Facility characteristics
Table 6.2	Case facility outcome summary
Table 6.3	Case facility CBI lead recommendations to facilitate moving forward with change
Table B.1:	Facility context summary guide
Table C.1:	EPL capacity-building intervention
Table E.1:	Cross-case analysis rating grid
Table E.2:	Rating to score conversion legend
Table F.1	Analysis of nutrition guidelines implementation process between More Successful (MS) and Less Successful (LS) facilities as guided by the Consolidated Framework for Implementation Research (CFIR)

LIST OF ABBREVIATIONS

CBI:	Capacity-building intervention
QCA:	Qualitative comparative analysis
CCAT:	Cross-case analysis team
CFIR:	Consolidated Framework for Implementation Research
EPL:	Eat, Play, Live
Food-EPI:	Food Environment Policy Index
mvQCA:	Multi-value qualitative comparative analysis
GL+CBI:	Guideline + capacity-building intervention
GL-ONLY:	Guideline only
LS:	Less Successful
MS:	More Successful
NO-GL:	No guidelines
PHRD:	Public Health Registered Dietitian
POP:	Point-of-purchase
PC:	Provincial Coordinator
QCA:	Qualitative comparative analysis
RD:	Registered Dietitian
RFP:	Request for proposal
rNEMS-R:	Reduced Nutrition Environment Measures Survey – Restaurant
SSB:	Sugar-sweetened beverage

1 INTRODUCTION

1.1 CONTEXT

Physical and social environments influence dietary behaviours [5]. The World Health Organization (WHO) considers supportive environments fundamental to shaping healthier food behaviour [6]. As a setting that children and adolescents are regularly exposed to, the recreation and sport facility environment has the potential to shape norms of behaviour for both physical activity and associated eating practices [7]. Food is commonly an integral part of this setting with strongly associated norms. Unfortunately, these environments are typically unhealthy [8, 9, 10, 11, 12, 13]. Fortunately, there is increasing recognition by health professionals and policymakers that recreation and sport environments have the potential to support healthy eating and influence eating behaviours [14, 15, 16, 17]. Policy action has been identified as necessary to mediate the food environment within this setting [16]. With the move toward policy implementation within this setting it is critical to understand the impact of existing policy guidelines and to evaluate the efficacy of policy intervention approaches in order to shape future action to best support healthy eating behaviours within recreation and sports settings in Canada.

This thesis research was positioned within the Eat, Play, Live (EPL) trial, designed to: 1) evaluate the impact of voluntary provincial nutrition guidelines in three Canadian provinces (British Columbia, Alberta, and Nova Scotia) relative to a non-intervention control province (Ontario), 2) investigate the impact of a randomly allocated 18-month capacity-building intervention (CBI) trial on improving healthfulness of the recreation food and sport environment, and 3) explore

guideline implementation context. Within this broader EPL research framework, this research extends the exploration of the policy implementation process and its relationship with outcomes to better prepare those in jurisdictions that are taking action on the food environment. The first research chapter assessed the Ontario recreation and sport facility food environment as an example of a jurisdiction without nutrition guidelines for this setting. The second research chapter examines the relationship between nutrition guideline implementation factors (guideline mobilization, facility context and facility-level policy), and changes to the healthfulness of food environments in facilities randomized to receive the EPL CBI. Finally, the third research chapter evaluates and frames the EPL CBI within the Consolidated Framework for Implementation Research (CFIR) [1] to identify ‘lessons learned’.

1.2 KEY LITERATURE

1.2.1 Why is healthy eating important?

Unhealthy dietary behaviours are prevalent among Canadian children and adolescents and have been identified as risk factors for obesity and chronic disease such as Type II Diabetes and cardiovascular disease [18, 19, 20, 21, 22, 23, 24, 25]. Evidence suggests that unhealthy dietary behaviours will persist into adulthood [26, 27, 28, 29, 30, 31]. Childhood obesity has also been found to track into adulthood [32, 33, 34], thus, reinforcing the importance of supporting development of healthy eating practices early in life.

1.2.2 Does the food environment matter?

Of particular concern for recreation and sport facilities is research indicating a relationship between nutrition environments and dietary intake in children [35]. Roberto et al. [36], in their

exploration of environmental versus individual drivers of obesity, characterize a reciprocal relationship between the food environment and personal choices. The authors detailed food environment factors that exploit biological and social vulnerabilities to increase both preference and demand for unhealthy food options [36]. This results in a cycle where the environment is further shaped by these preferences and demand [36]. Supportive food environments can help break the cycle by making the healthier choice the easy choice. Creating such environments is one of the five priority action areas of the Ottawa Charter [15]. Also, as part of Health Canada's healthy eating strategy to make healthier choices easier, creating a healthy eating environment is included as part of the 2019 revision of Canada's Food Guide [37, 38]. Clearly environment plays a role in healthy eating.

1.2.3 What does the recreation and sport facility food environment look like?

As national [39] and other Canadian [8, 9, 40, 10, 41, 11, 12] and international studies [13, 42, 43, 44] attest, recreation and sport facility food environments are predominantly unhealthy. There is also an ever-increasing body of evidence documenting perceived barriers to providing healthy food options within recreation and sport facilities. This includes: the perception that healthy foods do not sell even if offered at competitive prices; reduced profit margins; customer demand and cultural norms favouring unhealthy foods; lack of a local champion; and lack of stakeholder buy-in [8, 45, 46, 10, 47, 48, 44, 49]. Competing interests also play an important role in shaping healthy food policy in recreation and sport facilities. Allender et al. [46] highlighted some of these, including political agendas, limited resources, the food and beverage industry, community pressures, concession vendors, and vending suppliers. Most, if

not all, research demonstrates an on-going conflict between community drivers and providing healthier food environments in this setting.

Current recreation and sport facility food environments could be seen as compromising their publicly funded mandate to support health and well-being [17, 50, 48, 51]. There is evidence that food and beverage sales mirror availability [52, 53, 54, 55] suggesting that recreation and sport facilities are, in fact, currently promoting unhealthy eating practices by offering predominantly unhealthy options. Given that these facilities are government funded, it is a reasonable expectation that the food services operating within them reinforce broader population health promotion goals and do not provide environments that conflict with those public health goals [56]. Further, promoting healthy lifestyles through sports participation while also promoting unhealthy eating practices gives children inconsistent health messages [17].

1.2.4 Why consider policy as an intervention?

Both the model proposed by Story et al. [7] for enhancing food environments and Glanz and colleagues' [57] Model of Community Nutrition illustrate the interplay between the multiple levels of influence and individual behaviour and suggest eating behaviours are best considered within the context of socio-ecological theory. Story et al. [7] propose that environmental policy actions across various levels of the socio-ecological framework can be among the most effective strategies to effect population level change in eating behaviour. Hawkes et al. [58] identified environment as a central mediator between preferences and behaviour in food policy mechanisms and suggests policy can play a powerful role in providing environments that encourage development of healthy preferences early in life. Together, these theoretical

underpinnings explain why nutrition policy must be a priority intervention action within the recreation and sport facility environment.

Support for policy as an intervention can also be found in the Food Environment Policy Index (Food-EPI) Canada Study which used the Index tool to examine food environment policy in Canada [16, 59]. While promising policy action to provide healthy food and support healthy food choices was found in government-funded settings internationally, there was little or no comparable policy implementation in Canada [16] and little, other than the updated Canada's Food guide, beyond the 2017 report [59]. Regulated policy and harmonizing guidelines across all public settings where children gather was recommended [16].

Regulatory intervention has also been identified as a requirement for change in this environment [58, 60, 46]. In this context the school food environment can be used as a comparator. Like schools, exposure to recreation and sport facility environments begins early in life and offers an opportunity for supporting the development of healthier preferences through exposure to a healthy food environment [36, 61]. Restricting the food and beverages offered for sale based upon nutrient content is the predominant policy approach taken in schools and evidence indicates that it can successfully influence eating behaviour in children and adolescents [62, 63, 64, 65, 66]. Fung et al. [64] even suggested that school food policy provides real world population-level evidence for the value of nutrition policy.

1.2.5 The state of recreation and sport facility food policy in Canada

Recreation and sport facility policy varies across provinces, however, to date no province has mandated nutrition standards policy in municipally funded recreation and sport facilities. British

Columbia (BC), Alberta (AB), Nova Scotia (NS), and Saskatchewan (SK) have all implemented voluntary policy guidelines [67, 2, 68, 69]. These guidelines set out minimum nutrition standards for food and beverages offered for sale in vending machines and at concessions, however, there is no compliance monitoring. Other provinces have yet to initiate guidelines. However, Manitoba (MB), New Brunswick (NB), Newfoundland and Labrador (NL), Ontario (ON), and Prince Edward Island (PE) all offer resources, such as toolkits, for improving the healthfulness of recreation and sport facility food offerings [70, 71].

1.2.6 What does food policy implementation look like in the recreation facility setting?

In provinces that have implemented voluntary policy, uptake is poor [8, 39, 41]. However, research in the recreation and sport facility setting investigating implementation support strategies, has identified a number of strategies that increase implementation outcomes [72, 73, 55, 74]. Our own research in provinces with voluntary provincial nutrition guidelines demonstrated a healthier food environment in those facilities randomly allocated to receive capacity-building support when compared to facilities offered only passive support resources [4]. The improvements, while modest, suggest this is an avenue for action. Yet, capacity specific barriers have also been identified, indicating that understanding when, where, and how to position implementation supports may be as important to successful interventions as the interventions themselves [48, 41, 54, 75].

2 SPECIFIC AIMS

2.1 RATIONALE

As described above, there is some research evaluating the recreation and sport facility food environment in jurisdictions with nutrition guidelines. First, however, it is important to have a clear picture of this environment in the absence of policy. As well, there is limited evidence regarding the effectiveness of capacity building strategies to improve policy implementation. This highlights the need for better understanding of how best to support policy implementation to accomplish meaningful change in this environment. To accomplish this, the EPL trial presented the opportunity to operationalize implementation factors within the capacity building intervention and assess their impact on the healthfulness of recreation and sport facility food environments. To support increasing healthfulness in this community setting, it was also important to evaluate these results and identify lessons learned by positioning the CBI within the context of policy implementation theory.

This research contributes to our understanding of policy implementation and supports policy planning and development, and policy-related decision-making in this community-based environment. It also extends implementation science literature for population level policy implementation.

2.2 RESEARCH OBJECTIVES

1. Describe recreation and sport facility food environments in the absence of provincial nutrition guidelines.
 - a. Assess the healthfulness of food and beverages offered for sale and vending beverage sales within a convenience sample of recreation and sport facilities in Ontario and compare between the cohort with a municipal policy banning the sale of water in single-serve plastic water bottles in municipally funded facilities versus the cohort without such a policy.
2. Explore components of the CBI that had the greatest impact on the healthfulness of food environments within recreation and sport facilities in nutrition guideline provinces (British Columbia, Alberta, Nova Scotia) randomized to receive the EPL CBI.
 - a. Examine the relationships among the implementation factors: guideline mobilization, facility context, and facility-level policy, and changes to the healthfulness of the food environment in facilities within nutrition guideline provinces randomized to receive the CBI; and
 - b. Describe and frame relationships between and among CBI components and changes to the healthfulness of recreation and sport facility food environments using the updated Consolidated Framework for Implementation Research (CFIR) [1].

3 METHODS

3.1 PREAMBLE

This chapter details EPL methods. Because this thesis is written in an integrated format, each of the research chapters (Chapter 4, 5, & 6) also includes a methods section. Those methods sections will include information, as described here, formatted for the data requirements of each study and publication guidelines. They also extend EPL methods to analytical approaches specific to the thesis objectives.

3.2 EAT, PLAY, LIVE

Research for this proposed thesis was conducted as part of the nutrition policy Eat, Play, Live (EPL) intervention trial examining recreation and sport facility food environments in four Canadian provinces.

3.2.1 Study Design

The overarching typology of EPL is a mixed-methods concurrent design [76, 77]. Within this approach, a randomized controlled trial embedded within a natural experiment was utilized. Recreation and sport facilities within three provinces (BC, AB, NS) with existing voluntary nutrition guidelines were randomized to guideline only (GL-ONLY) or 18-month capacity-building intervention (GL+CBI) groups. Ontario facilities were positioned as the comparison condition group (NO-GL).

3.2.2 Eligibility Criteria

Facilities were eligible to participate if they offered food and beverages through concession and/or vending, had no plans in place to change food and beverage services for the 18-month

duration of the study, and had not participated in studies targeting change in recreational food environments in the previous five years.

3.2.3 Recruitment

Provincial Parks and Recreation Associations in the four provinces posted information about the study on their website and circulated email invitations to membership. Follow-up to these invitations with recreation and sport facility management was made by provincial research teams.

Of 286 facilities approached, 145 responded to follow-up telephone calls or emails: a response rate of 50.2% [39]. Of those, 70 were ineligible, 11 lacked the staff capacity, two were not interested in participating in the research, one was not willing to accept potential random allocation to the GL-ONLY group, one feared loss of revenue, and 11 provided no reason for not wanting to participate [39]. Therefore, a total of 49 facilities were enrolled; 32 in guideline provinces (BC: n=14, AB: n=11, NS: n=7) and 17 in the no guideline control province.

3.2.4 Data Collection & Measures

The following data and indicators are used within this thesis:

1. Food environment quality
 - a. Vending profile
 - b. Concession profile
2. Patron purchasing
3. Facility-level policy
4. Facility context summary
5. Facility representative interviews

3.2.4.1 Food Environment

Environmental assessment data were collected for all three groups at the beginning at end of the 18-month intervention period.

3.2.4.1.1 Vending Product Profiles

Four vending machines in each facility (two snack and two beverage vending machines) were randomly selected using a remotely generated computer randomization sequence for audit. For each machine, the total number of slots was counted and a detailed description of products in each slot including brand, product variety/type, size, flavour, and price was recorded. Test-retest and inter-rater reliability for the vending audit process using the profiling scheme was previously shown to be high (≥ 0.88) [9].

All packaged products were classified according to the British Columbia Ministry of Health nutrition profiling scheme [2] to allow comparison across all participating provinces. Moderate to good agreement (construct validity) in 'healthfulness ratings' across the three provincial nutrient profiling schemes has been previously shown [78]. The healthfulness of products was assessed by classifying each as *Sell Most*, *Sell Sometimes*, and *Do Not Sell* to determine the proportion of items that fell within each category.

3.2.4.1.2 Concession Profiles

Concession food environments were measured objectively using an adapted version of the Nutrition Environment Measures Survey-Restaurant reduced item audit (rNEMS-R) [3]. The original NEMS-R is an observational measure that assesses factors hypothesized to influence food selection in restaurants, including food availability, facilitators and barriers to healthy eating, pricing, and promotions [79]. The rNEMS-R consists of 25% of items from the original

tool that are most strongly correlated to the total NEMS score and weakly correlated to each other [3]. Total scores can range from -4 to +48 for the Fast Casual Summary and -10 to +51 for the Fast Summary, with higher scores indicating greater availability and lower cost of healthy options, and support for healthy choices [3].

The rNEMS-R identifies healthy main dishes based on their energy and fat content. However, as detailed nutritional information for menu items was not available in most concessions, main dish items are defined as items with a protein source and at least one other food group.

Healthy main dish items were therefore defined as items that achieved a score of three, where one point was allocated for each of the following: whole grains, a serving of vegetables (not including potatoes), and a quality protein (defined as items within the Meats and Alternatives group in Canada's Food Guide 2007 version [80]); and where one point was subtracted for having added fats in the form of sauces or a fried side dish.

The following questions were added as healthy food/cooking markers, most of which were from the full NEMS-R although not included in the rNEMS-R, score to better fit the recreational and sport facility context and to allow greater differentiation between facilities:

1. Availability of each of a deep-fat fryer, griddle, grill and/or oven;
2. Availability of each of white bread, deep-fat fried French Fries and regular chips;
3. Number of healthy main dish options (including salads) available; and
4. Availability of alcohol on the premises.

Packaged food and beverage items for sale in concessions were evaluated using the same methods of categorization used for vending machines. A detailed description of products

available for sale including brand, product variety/type, size, flavour, and price was recorded. Products available at point-of-purchase, defined as within one metre of a cash register, were also documented, and assessed separately.

3.2.4.2 Patron Purchasing

3.2.4.2.1 Vending

Snack and beverage vendors provided itemized sales data for products sold in vending machines collected targeting a two-week period that aligned with facility audits.

3.2.4.2.2 Concession(s)

Concession food and beverage sales data were also collected for a targeted two-week period coinciding with vending sales data collection. Concession vendors provided itemized lists of items sold (either electronically or manually recorded).

3.2.4.3 Facility-level Policy Assessment

Information regarding the existence of facility-level food and beverage related policies was collected using at baseline and follow-up using purpose-built questions ([Appendix A](#)) Within the questionnaire, facility representatives were also asked to provide provincial coordinators with a copy of existing documented facility-level policy(ies) if they responded yes to questions about facility-level policy(ies) being in place.

3.2.4.4 Facility Context Summary

A facility context data summary was maintained for each facility by Provincial Coordinators. This encompassed baseline and follow-up summary (see [Appendix B](#)) and documentation of relevant context changes (e.g., changes in concession contractors) across the study period. Further context related indicators are detailed in [Chapter 5](#).

3.2.4.5 Capacity Building Intervention

The capacity-building intervention was guided by the socio-ecological framework using a whole of settings approach and based upon pilot studies conducted by the project lead P-J Naylor [74, 40, 81, 82]. Participating recreation and sport facilities within the three guideline provinces were randomly allocated to the capacity-building intervention condition (GL+CBI).

Intervention condition protocols to support a change in facility practices to increase uptake of voluntary provincial guidelines were as follows:

1. One-time intra-provincial training workshop with designated facility representatives
2. Facilitated goal setting individualized for each facility based upon baseline assessment
3. Implementation planning activities (e.g., facility planning team, action plan)
4. EPL provincial coordinator on-demand support
5. EPL provincial coordinator monthly check-in
6. Electronic tools and resources
7. \$1000 grant for each facility to support intervention action plan

[Appendix C](#) provides a detailed breakdown of the CBI activities and resources.

3.2.4.6 Interviews

At mid-intervention (approximately six months), a key management or staff representative from GL+CBI recreation and sport facilities was invited to participate in an interview. At the end of the research period, a key management or staff representative from all participating facilities was also invited to participate in an interview.

Interviews were conducted by telephone using a semi-structured interview guide (see [Appendix D](#)) with questions defined based upon intervention condition. Provincial coordinators, located in a different province, conducted interviews to reduce bias. For example, SC (author) conducted n=5 interviews with respondents from Nova Scotia. Interviews were audio-recorded, transcribed verbatim, and anonymized.

3.2.5 Analysis

Descriptive and comparative statistics were calculated using IBM SPSS Statistics for Windows (Version 27, IBM Corp., Armonk, NY) and Microsoft Excel (Version 365). NVivo 14 [83] was used to support qualitative analysis. For more detailed analysis plans, see Chapters [4](#), [5](#), and [6](#).

3.2.6 Ethics Approval

This research received ethics clearance from the University of Waterloo Office of Research Ethics (ORE file #20568) as well as the research ethics boards at the University of Victoria, the University of British Columbia, the University of Alberta, and Dalhousie University. Facility representatives provided written, informed consent for facility participation.

4 RECREATION FACILITY FOOD AND BEVERAGE ENVIRONMENTS IN ONTARIO: AN APPEAL FOR POLICY

Authors

M. Susan Caswell¹, Patti-Jean Naylor², Dana Lee Olstad³, Sara F.L. Kirk⁴, Louise C. Mâsse⁵, Kim D. Raine⁶, Rhona M. Hanning¹

¹*School of Public Health Sciences, Faculty of Health, University of Waterloo*

²*Institute of Applied Physical Activity and Health Research, School of Exercise Science, Physical and Health Education, University of Victoria*

³*Department of Community Health Sciences, Cumming School of Medicine, University of Calgary*

⁴*Healthy Populations Institute, Dalhousie University*

⁵*BC Children's Hospital Research Institute, School of Population and Public Health, University of British Columbia*

⁶*School of Public Health, University of Alberta*

Citation

Caswell MS, Naylor P-J, Olstad DL, Kirk SFL, Mâsse LC, Raine KD, Hanning RM (2021) Recreation facility food and beverage environments in Ontario, Canada: An appeal for policy. *International Journal of Environmental Research and Public Health*. 18, 8174. DOI: 10.3390/ijerph18158174.

4.1 PREAMBLE

This chapter is represented as published in 2021 ([Publication link](#)). Since the time of publication some new literature has appeared that is relevant to the topic. This literature is integrated in other sections of the thesis. The new information included in these sources in no way alters the conclusions or contribution of the chapter. This chapter has also benefited from peer review.

As per thesis formatting guidelines, the abstract was removed.

4.2 INTRODUCTION

Municipally funded recreation and sport facilities, also known in some jurisdictions as sports clubs, are an environment with a mandate to promote physical activity. Kokko [56] conceptualized recreation facilities/sports clubs as a health-promoting setting and identified nutrition-related activities as an important theme. Since healthy food environments are fundamental to supporting healthy dietary practices [6], recreation facilities are uniquely positioned to both model a healthy food environment and to promote healthy eating practices [84]. Moreover, given the high levels of child and youth attendance [85], recreation facilities, similar to schools, are an environment with the potential to support the development of healthier preferences and have a measurable, lasting influence [36, 48, 61].

An unfortunate paradox is the poor nutritional quality of the food prevalent in these settings, which are supposed to promote community well-being; the food environment within recreation facilities is typically unhealthy [11, 41, 40, 10, 43, 42, 13, 9]. A key reason is the pervading availability of food vending machines and concession-style food services. Within Canada, snack vending machines typically contain packaged, non-perishable snack foods low in nutrients and high in fat, sugar, salt, and calories, such as candy, chocolate bars, and chips/crisps, while beverage vending machines typically contain sugar sweetened carbonated beverages, sports drinks, energy drinks, bottled water, and artificially sweetened 'diet' beverages, usually in plastic bottles greater than 500 mL. In addition, concessions offer predominantly ultra-processed [86], low-cost prepared foods, such as French fries, and limited, if any, healthier options.

Places where children spend time, learn, and play should support healthy choices and offer consistent messaging [17, 87]. In Ontario, the school food and beverage policy (P/PM 150) mandates that the foods offered for sale meet nutrition guidelines [88]; however, recreation facilities have no such policy. Consistency across these environments would allow the messages to be internalized and to help normalize healthier food choices [36]. Furthermore, given that these facilities are government funded, it is a reasonable expectation that they reinforce broader population health promotion and do not provide environments that conflict with public health goals [56].

There is increasing recognition by health professionals and policymakers that recreation facilities have the potential to support healthy eating [41, 47, 89, 90, 9]. As a result, there has been a move to implement nutrition policy within recreation and sport facilities in Canada, with a number of provinces implementing voluntary nutrition policies or guidelines [67, 2, 68]. Ontario, with some municipal-level exceptions, has yet to implement recreation facility nutrition policies or guidelines. Voluntary nutrition guidelines have been associated with a shift towards healthier food environments, especially where there were capacity building strategies to support policy implementation [39, 4, 8]. However, even where there was a positive shift in the healthfulness of food environments, most foods offered fell well below the recommendations [39, 4, 8].

As Allender et al. [46] found in Victoria, Australia, promoting healthy food may not be a priority for local governments; key informants reported that food policies lacked relevance or was outside of their mandate, a sentiment also reflected elsewhere [48, 8, 51, 50]. There is also an increasing body of evidence on perceived barriers to policy development and implementation

within recreation facilities, including competing priorities, fears of financial losses, lack of local champions, poor stakeholder buy-in, and cultural norms that favour unhealthy foods [13, 8, 46, 45, 49]. Ontario can learn from the experience of others.

Data for the current study were collected as part of the larger cross-Canada nutrition policy intervention trial Eat, Play, Live (EPL), described elsewhere [39, 4]. The province of Ontario served as the comparative province for EPL, being without specific nutrition guidelines or policies governing municipal recreation and sport facilities. Most studies on food environments, with a few exceptions [13, 46, 51], examine what is offered for sale, but EPL also looked at what was actually sold. The primary objective of this paper was to provide a snapshot of the healthfulness of the food environment in a sample of municipally funded recreation and sport facilities across the province of Ontario, Canada, and how that was reflected in vending sales.

In Ontario, municipal concerns about the environmental impact of single-use plastic bottles have led several jurisdictions to institute bans on the sale of bottled water within municipally funded buildings. Outside the control or intention of the investigators, half of the EPL Ontario facilities were within these jurisdictions. This provided a natural experiment to examine whether the bottled water ban policy affected the healthfulness of the facility food and beverage environment and beverage sales. Therefore, the purpose of this study is two-fold and the secondary objective was to compare the nutrition environments and vending beverage sales of the cohort of participating facilities within municipalities with a bottled-water ban policy versus the cohort of facilities without such a policy. We hypothesized that, since the water-bottle ban policies did not limit the sale of other beverages in plastic bottles, the

beverage environment would be less healthy in the water-ban policy cohort while there would be no difference in the healthfulness of the food offered.

4.3 MATERIALS AND METHODS

4.3.1 Study Design

This project was guided by a larger research group and a smaller provincial advisory group comprised of health professionals.

Cross-sectional descriptive data on the food environments in municipal recreation and sport facilities in Ontario were collected on two occasions, corresponding to the baseline and follow-up times of the intervention provinces in the larger EPL trial. Facilities were eligible to participate in EPL if they had a concession that was open year-round, had neither taken action to change their facility food environment nor participated in studies targeting change in recreational food environments in the previous five years, and had no plans to change food and beverage services for the 18-month duration of the study. Clinical Trials Registration: ISRCTN14669997 3 July 2018 (retrospectively registered).

4.3.2 Recruitment

The provincial study partner, Parks and Recreation Ontario, distributed an email containing a participation invitation letter to senior municipal recreation contacts across the province. The invitation was forwarded to recreation and sport facilities believed to be eligible to participate. After this, the EPL research team followed up with the facility contacts by telephone. Of the 53 sites approached, seventeen were recruited to participate. Of the non-participating facilities, five did not respond to contact attempts; two declined to participate, citing poor timing and

concession restructuring; one did not submit a participation agreement; and twenty-eight did not qualify. Hence, 68% of eligible facilities participated.

4.3.3 Data Collection and Measures

Primary outcomes were measured in Ontario between February and April 2016 and between September 2017 and January 2018. The measures included vending product profiles, concession packaged product and menu profiles, concession food environment assessment, and vending sales. A requirement of the audit was that concessions be open to patrons. With concession hours closely linked to facility traffic volume, audit times varied according to facility (i.e., some facilities only had concessions open evenings and week-ends). Audit data were collected by the primary author (S.C.) and included both vending and concession food and beverages, as detailed below.

4.3.3.1 Vending

Four vending machines per facility were randomly selected using a remotely generated computer randomization sequence: two beverages and two snacks. A detailed description of the packaged food and beverage products available for sale, including brand, product variety/type, size, flavour, and price was recorded. The healthfulness of products was then assessed by classifying each one according to established British Columbia, Canada Ministry of Health Guidelines as *Sell Most*, *Sell Sometimes*, and *Do Not Sell* [2]. *Sell Most* are the healthiest options, high in essential nutrients and low in sodium, sugar, and fat. *Sell Sometimes* products provide essential nutrients but with higher amounts of sodium, sugar, and/or fat. *Do Not Sell* have high fat, sodium, or sugar and are nutrient poor [2]. Test-retest and inter-rater reliability for this audit process was previously shown to be high (≥ 0.88) [40].

4.3.3.2 Concession

Packaged food and beverage items for sale in concessions were recorded and evaluated using the same categorization used for vending machines. Products available at point-of-purchase, defined as within one metre of a cash register, were also documented and assessed separately.

Concession food environments were measured using a validated adapted version of the Nutrition Environment Measures Survey-Restaurant reduced item audit (rNEMS-R) Fast Casual and Fast Food Summary [3]. Food environment scores using rNEMS-R can range from -4 to +48 for the Fast Casual Summary and from -10 to +51 for the Fast Food Summary, with higher scores indicating greater availability and lower cost of healthy options, and support making healthier choices [3]. Main dish items were defined as items with a protein source and at least one other food group. As a menu nutritional analysis of prepared items was not feasible in this context, a harmonized food and beverage classification scheme was created to provide a consistent basis to classify the healthfulness of these main dish items. Healthy main dish options were given a score of three, and lower scores indicated less healthfulness. Full details of the classification scheme are presented elsewhere [39]. In addition, to allow for greater differentiation between facilities, the availability of specific marker foods (e.g., fresh fruit and vegetables, low-fat milk, and fried and baked French fries) and preparation equipment were recorded.

4.3.3.3 Vending Sales

Snack and beverage vendors provided itemized sales data for products sold in vending machines, targeting a two-week period around concession and vending audits. The time frame ranged from 14 to 31 days due to machine refill schedules and was normalized to two weeks.

4.3.4 Analyses

As Ontario was the non-intervention control province for EPL, no differences in audit and sales data were observed between baseline and follow-up data collection [4]. Hence, the data collected at both time points were averaged for the current analyses. Descriptive and comparative statistics were calculated using IBM SPSS Statistics for Windows 27 and Microsoft Excel. A *t*-test, assuming unequal variance, was used to determine the differences between facilities within the bottled water ban cohort (H₂O Ban) and facilities without a bottled-water ban (H₂O) for their mean proportion of food/beverage items offered or sold by category (*Sell Most*, *Sell Sometimes*, and *Do Not Sell*) for each of vending, concession packaged, or point-of-purchase. Items with no nutritional value (e.g., tea, coffee, gum, and throat lozenges) were excluded.

4.3.5 Ethics Clearance and Consent

This study received ethics clearance from the University of Waterloo Office of Research Ethics (ORE file #20913) as well as the research ethics boards at the University of Victoria, the University of British Columbia, the University of Alberta, and Dalhousie University. Facility representatives provided written, informed consent for facility participation.

4.4 RESULTS

4.4.1 Participating Facilities

Between baseline and follow-up, one facility closed its concession, making it ineligible. Therefore, 16 Ontario facilities were included of the 17 recruited (See Table 4.1 for the facility characteristics). Eight facilities were located in municipalities with a regulated policy banning the sale of bottled water (H₂O Ban), and eight were in municipalities with no restrictions (H₂O).

All 16 facilities provided beverage vending machines ($\bar{x} = 3.5$; $\tilde{x} = 3$; range 1–7 per facility), while 12 also provided snack vending (of these, $\bar{x} = 2$; $\tilde{x} = 2$; range 1–4). There were no changes to the number of vending machines between baseline and follow-up, with the exception of one facility adding an ice cream vending machine. Participating facilities had concessions operating twelve months of the year: 15 facilities with a single concession offering both packaged and prepared foods and one facility with a second concession offered packaged snacks and beverages but not prepared menu items.

Table 4.1. Facility characteristics according to H₂O and H₂O Ban policy conditions.

Characteristic	H ₂ O	H ₂ O Ban
Facilities (n)	8	8
Community size ^a (% of facilities)		
Rural	0.0	0.0
Small population centre	12.5	12.5
Medium population centre	37.5	25.0
Large urban population centre	50.0	62.5
Facility size ^b (% of facilities)		
Small	0.0	12.5
Medium	37.5	25.0
Large	62.5	62.5
Vending machines (mean number)		
Vending machines	5.9 (range 2–15; $\tilde{x} = 5$)	6.6 (range 2–11; $\tilde{x} = 7$)
Beverage vending machines	3.9 (range 1–7; $\tilde{x} = 4$)	3.8 (range 1–6; $\tilde{x} = 4.5$)
^a Classified according to Statistics Canada values and definitions [91, 92]. ^b A small facility had at least one minor or major amenity; a medium facility had at least two amenities, one of which was major; and a large facility had at least three amenities, two of which were major. Major amenities: ice rink, swimming pool, multiple courts (e.g., tennis, squash/racquetball), and theatre (e.g., movie, performing arts). Minor amenities: community and multi-purpose room, fitness room, and small specialty area such as a small climbing wall or gymnastics room.		

4.4.2 Site Audits

Table 4.2 provides a breakdown for the H₂O and H₂O Ban cohorts for vending and concession packaged food and beverages, and concession point-of-purchase items. All packaged food and beverage offerings were profiled and classified based on existing provincial guidelines as *Sell Most*, *Sell Sometimes*, and *Do Not Sell* [2]. It should be noted that bottled water is categorized as *Sell Most*.

Table 4.2. Packaged food and beverages: mean proportion of offerings according to H₂O and H₂O Ban policy conditions.

	H ₂ O Mean % (SD)	H ₂ O Ban Mean % (SD)	p Value ^a
Concession packaged snack foods			
Facilities (n)	8	8	
Sell Most	0.7 (1.3)	1.1 (2.2)	0.684
Sell Sometimes	5.2 (6.8)	5.0 (3.2)	0.813
Do Not Sell	94.1 (7.5)	94.3 (3.7)	0.932
Concession point-of-purchase food & beverages			
Facilities (n)	8	5	
Sell Most	3.4 (5.5)	0.7 (1.5)	0.218
Sell Sometimes	9.7 (11.8)	7.0 (5.4)	0.579
Do Not Sell	86.9 (15.2)	92.4 (5.3)	0.375
Concession packaged beverages			
Facilities (n)	8	8	
Sell Most	7.3 (1.9)	0.6 (1.2)	<0.001 *
Sell Sometimes	16.0 (7.0)	12.5 (5.5)	0.289
Do Not Sell	76.7 (7.0)	86.9 (5.3)	0.006 *
Vending packaged snack foods			
Facilities (n)	5	7	
Sell Most	0.7 (0.8)	4.3 (4.3)	0.070
Sell Sometimes	3.1 (2.0)	8.6 (3.9)	0.012 *
Do Not Sell	96.3 (1.3)	87.1 (6.9)	0.011 *
Vending beverages			
Facilities (n)	8	8	
Sell Most	13.5 (8.1)	0.6 (1.8)	0.002 *
Sell Sometimes	12.7 (6.6)	11.4 (4.9)	0.664
Do Not Sell	73.8 (11.8)	88.0 (4.6)	0.011 *

* $p < 0.05$; a t -test comparing facility means.

4.4.3 Vending Offerings

For beverage vending, there was a significant difference between the H₂O and H₂O Ban cohorts for mean proportions in both the *Sell Most* and *Do Not Sell* categories that were offered (See Table 4.2). H₂O Ban facilities had a higher mean proportion of *Do Not Sell* and a lower mean proportion of *Sell Most*. However, even in the H₂O cohort facilities, *Do Not Sell* beverages still accounted for over 70% of the vending beverages offered.

For snack vending, product profiling categorized most products offered as *Do Not Sell* for both cohorts (See Table 4.2). Almost none of the product offerings were *Sell Most*, and only a small proportion were *Sell Sometimes*. There were significant differences between the cohorts for vending snack categories, with the H₂O Ban facilities having proportionately more *Sell Sometimes* and fewer *Do Not Sell* items.

4.4.4 Concession Packaged Food, Beverages, and Point-of-Purchase Offerings

The mean number of packaged beverage options for H₂O and H₂O Ban facilities was 19.9 (SD = 5; $\bar{x}$ = 20; range 10–28) and 21.6 (SD = 6.1; $\bar{x}$ = 21; range 15–34), respectively. As with vending beverages, there was a significant difference between the H₂O and H₂O Ban cohorts for mean proportions of beverages within both the *Sell Most* and *Do Not Sell* categories (See Table 4.2). Again, H₂O Ban facilities had a higher mean proportion of *Do Not Sell* and a lower mean proportion of *Sell Most* items.

The mean number of concession packaged snack options for H₂O and H₂O Ban facilities was 24.3 (SD = 3.7; $\bar{x}$ = 24; range 20–31) and 24.4 (SD = 13.8; $\bar{x}$ = 23; range 6–48), respectively. For concession packaged food, there were no significant differences in healthfulness categorization

between the H₂O and H₂O Ban cohorts; both offered predominantly *Do No Sell* items. As seen in Table 4.2, only about 1% of concession packaged food were *Sell Most* foods in both cohorts.

Most (n = 13) concessions offered packaged point-of-purchase snack and beverage items at the register. The mean numbers of point-of-purchase snack and beverage items for H₂O (n = 8) and H₂O Ban (n = 5) facilities were 14.8 (SD = 12.8; $\bar{x}$ = 11; range 2–40) and 10.4 (SD = 12.3; $\bar{x}$ = 5; range 0–33), respectively. There was no significant difference in the number of items offered between the two cohorts (p = 0.942). There were also no significant differences in categorization between point-of-purchase snack and beverage offerings and between the H₂O and H₂O Ban cohorts, with both offering predominantly *Do Not Sell* items (See Table 4.2).

4.4.5 Concession Menus and Food Environment

Table 4.3 summarizes the menu marker foods and entrée scoring. Six H₂O and five H₂O Ban facilities used deep fat fryers and offered deep fried menu options, including French fries, onion rings, and chicken fingers. No facilities in either cohort offered baked French fries, baked chips, or healthy main dish salads. Only one facility offered salad as a side dish, and low-fat dressing was not an available option. All facilities in both cohorts offered 100% fruit juice, milk (not low-fat), and chocolate milk as beverage options. Fruit was available at two H₂O facilities; however, it was listed as a menu item at only one of those facilities. Fresh vegetables (e.g., veggie sticks) were a menu option at one H₂O facility; however, none were available for purchase at either audit timepoint.

Table 4.3. Concession menu offerings^a according to H₂O and H₂O Ban policy conditions

	H₂O	H₂O Ban
Facilities (n)	8	8
Marker foods (% of facilities offering each of the marker foods & beverages)		
Low fat white milk	0	0
White milk (2%, whole)	100	100
Chocolate milk	100	100
100% Juice	100	100
Fried French fries	75	62.5
Baked French fries	0	0
Potato chips—Regular	100	100
Potato chips—Baked	0	0
Fresh fruit	25.	0
Fresh vegetables	12.5	0
High fat side dishes	87.5	62.5
Healthy main dish salad	0	0
Prepared entrées		
Mean # of Entrées (SD; Median; range)	6.7 (5.8; 3.5; 1–16)	3.5 (4.9; 2.5; 1–15)
Entrée healthfulness score (# of facilities)		
Score = 3	0	0
Score = 2	0	0
Score = 1	37.5	12.5
Score = 0	100	75
Score < 0	62.5	37.5
Scoring: Maximum 3 (healthy)—<1 (least healthy);		
^a for ease of presentation, the data shown are for Time 2 data collection only.		

The mean facility Fast Casual and Fast Food summary scores are shown in Figures 4.1 and 4.2, respectively. There were no significant differences between H₂O Ban and H₂O facility scores. Importantly, the scores indicate a poor nutrition environment for both cohorts.

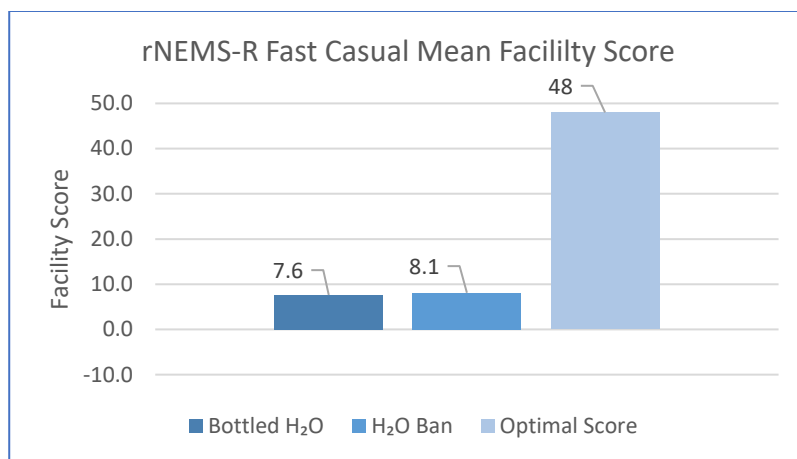


Figure 4.1. rNEMS–R Fast Casual mean facility score according to H₂O and H₂O Ban.

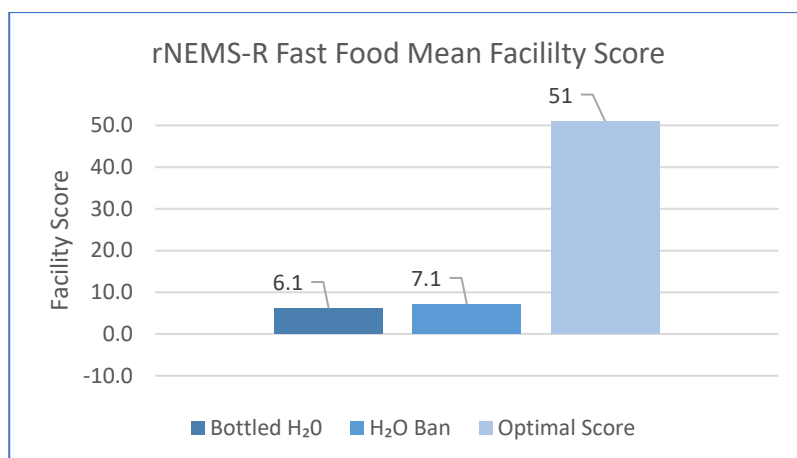


Figure 4.2. rNEMS–R Fast Food mean facility score according to H₂O and H₂O Ban.

4.4.6 Vending Sales

Beverage vending sales reflected the profiles of products offered for sale when analyzed by both mean proportion of items sold for each category and by mean proportion of sales dollars for each category. Significant differences between the H₂O and H₂O Ban facilities can be seen for both *Sell Most* and *Do Not Sell* (See Table 4.4). The mean proportion of *Sell Most* items sold and the mean proportion *Sell Most* sales dollars were higher in H₂O facilities, whereas the mean

proportion of *Do Not Sell* items sold and the mean proportion *Do Not Sell* sales dollars were higher in H₂O Ban facilities. Even in H₂O facilities, almost 80% of items sold and sales dollars came from *Do Not Sell* beverages.

When considering vending snack sales, the proportion of items sold was also significantly different between the H₂O Ban and H₂O facilities in the *Do Not Sell* and *Sell Sometimes* categories, reflecting the slight but significant difference in H₂O facility offerings above (See Table 4.4). However, within each cohort, there was an apparently higher mean proportion of *Do Not Sell* items sold than the mean proportion of *Do Not Sell* items offered for sale.

Table 4.4. Vending sales according to H₂O and H₂O Ban policy conditions.

	H ₂ O Mean % (SD)	H ₂ O Ban Mean % (SD)	<i>p</i> Value ^a
Snack vending sales			
Proportion of Items Sold			
Facilities (<i>n</i>)	3	5	
Sell Most	0.2(0.3)	3.4 (3.0)	0.076
Sell Sometimes	1.2 (1.0)	4.9 (2.1)	0.028 *
Do Not Sell	99.3 (0.4)	92.6 (2.0)	0.002 *
Beverage vending sales			
Proportion of Items Sold			
Facilities (<i>n</i>)	7	5	
Sell Most	14.8 (2.3)	0 (0.0)	<0.001 *
Sell Sometimes	6.4 (5.1)	9.3 (4.0)	0.322
Do Not Sell	78.8 (5.0)	90.4 (4.6)	0.002 *
Proportion of Sales Dollars			
Facilities (<i>n</i>)	7	5	
Sell Most	13.5 (2.5)	0 (0.0)	<0.001 *
Sell Sometimes	6.3 (5.1)	8.9 (3.7)	0.353
Do Not Sell	80.3 (4.4)	91.1 (3.7)	0.001 *

* *p* < 0.05; ^a *t*-test comparing facility means.

DISCUSSION

Recreation and sport facilities are an important setting when considering influences on eating practices. As an environment in which many children spend considerable time, unhealthy food options have the potential to do harm [35]. The results clearly demonstrate that the food environment is unhealthy in these facilities. The majority of the items sold were ultra-processed, energy-dense, and nutrient-poor, and it is noteworthy that vending sales data indicated that the unhealthy food environment within the participating facilities translated to food purchases. Our data also demonstrated the power of policy. Not only was the healthfulness of the food offered and sold in Ontario worse than in other provinces with nutrition policy [39] but also a municipal policy to ban water in plastic bottles while allowing other drinks in plastic bottles was evidenced in the adverse effect it had on the food nutrition profile in the H₂O Ban facilities.

4.4.7 Facility Food Environment

The primary objective of this research was to describe the food environment in Ontario's municipally funded recreation and sport facilities. Packaged snack and beverage offerings through vending machines and within concessions were predominantly categorized as *Do Not Sell*. Food environment scores were well below the ideal for both rNEMS-R Fast Casual and Fast Food, indicating that few healthy options were offered in concession food services. None of the facilities offered prepared menu items that received a healthy score. Marker foods indicated a predominance of unhealthy choices and limited, if any, availability of healthier options. Unfortunately, this picture is not atypical of recreation and sport facility food environments across Canada [10, 39, 8, 9] or globally [43, 42, 93]. It is also relevant that including healthy

items on the menu boards did not translate into actual availability; the absence of the menu item veggie sticks, noted during both audits of one facility, was described by the staff as the norm rather than the exception.

The sales data for vending snacks and beverages were also predominantly from the *Do Not Sell* category, supporting prior research suggesting that food and beverage purchases reflect their proportionate availability [52, 53]. If most items are unhealthy, the probability of purchasing a healthy option may be lower. In light of current findings that product availability reflects product sales, improving the healthfulness of recreation food environments should be a priority.

4.4.8 H₂O vs. H₂O Ban

The presence of a single-use plastic bottled-water ban in half of the participating facilities presented the opportunity to assess unintended consequences of environmental sustainability policy with health promotion implications. Therefore, a second objective of this study was to examine the associations between municipal bottled water bans and the healthfulness of recreation and sport facility food and beverage availability and sales. One of the most interesting and novel findings was that, while overall both the H₂O and H₂O Ban facilities were clearly unhealthy food environments, there were significant differences between the two cohorts. Where plastic water bottles were banned, empty vending slots and concession beverage options were replaced with less healthy beverages also in plastic bottles. While the environmental and practical intentions of plastic water bottle bans is to divert plastic from landfills, it is clear from this data that unintended impacts on food environments and health may not have been fully considered [94].

As would be expected, the restriction of bottled water (a healthy beverage choice), meant that the preponderance of beverages offered and sold through vending machines and concessions were less healthy options. As water was categorized as *Sell Most*, the restriction on the sale of bottled water resulted in the facilities with a ban having a higher proportion of *Do Not Sell* beverages and a lower proportion of *Sell Most* beverages, both available and sold. The one H₂O Ban facility offering *Sell Most* beverages was able to do so as they sold carbonated water in glass bottles, so it did not contravene the plastic bottle restriction. It is also important to note that all participating facilities had water fountains for refillable bottles, so while the availability of bottled water was not a limiting factor for drinking water, it required pre-planning for patrons. Anyone wanting to purchase a beverage would have few healthy options.

How differences in product offerings translated to sales is of particular importance. It was observed that the proportion of *Do Not Sell* and *Sell Sometimes* vending snack items sold aligned with the proportions of products offered in both cohorts. This suggests that sales mirrored product availability in both cohorts, a pattern demonstrated elsewhere [52, 53]. This pattern was also true of vending beverages sales. Hence, in the absence of water, there was not a proportional shift in sales to the next healthiest *Sell Sometimes* choice but rather sales reflected the dominant *Do Not Sell* beverage availability. The variation in facilities' sizes and services and the lack of pre-policy data does not allow us to calculate the absolute differences in sales. At the very least, the H₂O Ban increased exposure to unhealthy *Do Not Sell* beverages and all but eliminated *Sell Most* vending and concession beverage options for facility patrons. Paradoxically, the bottled water ban may encourage the purchase of alternate beverages, also packaged in single-use plastic bottles, thereby increasing consumption of sugar-sweetened

beverages. With newer environmentally sustainable packaging options, there may be ways forward where both goals can be met [95, 96]. For example, bio-based bottles would allow for the sale of bottled water while supporting environmental goals [97].

4.4.9 A Call for Nutrition Policy

This study provides an example of how recreation and sport facilities operate in the absence of nutrition policy. The unhealthy food environment revealed in this study points to the necessity and value of policy action to provide an environment that encourages both the development and reinforcement of healthy eating practices among children and youth. Voluntary guidelines are insufficient. Voluntary policy is an acknowledgement of the value of changing the food environment without the leverage of accountability and monitoring. Other Canadian provinces have instituted a voluntary nutrition policy for recreation and sport facilities in combination with capacity building and nudging approaches to encourage healthier choices [11, 39, 4, 8, 52, 74, 98]. However, while they demonstrated success in shifting the healthfulness of food offerings, the magnitude of change was small and food environments remained largely unhealthy [39, 8, 98]. The positive findings with low-intensity interventions have to be examined in the face of the overwhelmingly unhealthy food environments that persist. To see the level of change that would support healthier eating patterns and to have an impact on children's food practices, policy approaches with more accountability appear to be warranted [36, 90, 64, 58].

One of the primary barriers to healthier food environments in recreation and sport settings is the entrenched cultural norms attached to the expected food experience within these facilities [13, 93, 99]. Changing the food environment requires a paradigm shift. While there is no doubt

that a multi-faceted approach is needed, an important tool to combat these norms is a mandated policy [87, 90, 16, 100]. Policy can play a powerful role in supporting environments that encourage learning healthy preferences early in life [58]. Lessons learned from earlier research indicate that policies can both support the development of healthier food preferences and alter norms in favour of a healthier eating environment [101]. Hawkes and colleagues' [58] theory of change identifies key nutrition policy mechanisms and indicates that environments are central mediators between preferences and behaviour; two of the policy mechanisms they identified are particularly relevant to the recreation and sport environment. The first mechanism is to provide environments that support food, social, and information for healthy-preference learning [58]. The second is to influence availability and presentation to encourage reconsideration of existing unhealthy preferences when making food choices, particularly at point-of-purchase [58]. Although preferences can be changed over time, it is easier to influence behaviour initially than to change it once established [102].

So, what options are available for Ontario? There is clearly a desire amongst the Ontario public health community to improve the healthfulness of the recreation and sport facility food environment and to support positive change. This is evidenced by programs such as The Healthy Kids Community Challenge, the publication of the Nutrition Resource Centre's 'Getting Started with Healthy Eating in Your Recreation Centre', and the Ontario Food and Nutrition Strategy [89, 103, 104]. All three highlight the importance of encouraging healthy eating practices by ensuring supportive environments. However, while Healthy Kids Community Challenge initiatives, such as posters, were picked up in some participating facilities, the impact on offerings and sales was negligible.

Restricting the food and beverages sold based upon nutrient content is one policy option. This approach has been taken in schools, and evidence indicates that it successfully influences eating practices in children and adolescents [64, 62, 63, 65, 105]. Fung et al. [64] indicated that the school nutrition policy provided “real world” evidence at a population level for the value of mandated policies promoting healthy eating. The Food-EPI Canada study, which used the Food Environment Policy Index tool to examine food environment policy in Canada, recommends extending Ontario’s policy approach with mandatory harmonized guidelines across schools, childcare settings, and recreation settings as a prioritized provincial-level action affirming the value of a legislative approach for this environment [90].

There are regions within Ontario that have implemented nutrition policy initiatives to support a healthier eating environment within local recreation and sport facilities. Additionally, there are regions that have removed concessions, although vending machines with unhealthy options remain, so this is only a partial response. Mandated provincial policy would ensure supportive environments across Ontario, not just in those regions with the political will to enact nutrition policy. Often, the children and youth participating in sports travel to other regions and experience different recreation and sport facility food environments. The lack of an overarching provincial or federal government level approach results in regional inequities and inconsistent messaging around healthy eating across municipally funded community food environments throughout the province [17, 46, 51]. Furthermore, in Ontario, as in other jurisdictions such as Australia, a localized recreation and sport facility nutrition policy is uncommon [45]. Patrons of those Ontario communities that are not proactive or without champions to encourage and support the inclusion of healthy options within the municipal recreation and sport facility food

environment are vulnerable to vendors and facility management that do not prioritize nutrition, making it is highly unlikely that efforts will be successful [106].

Our results demonstrated that an enforced, regulated policy does indeed have an impact. This was seen with the policy banning single-use plastics for water but not banning single-use plastic sugar-sweetened beverages. The healthfulness of the nutrition environment shifted, as did the healthfulness of patron beverage purchasing. Nutrition policy at the provincial or national levels with appropriate implementation, capacity-building, and enforcement supports could mitigate such conflicts with local agendas [16]. Without such an overarching policy, healthy recreation food environments may be hindered by local political agendas, limited resources, regional public health priorities, community pressures, concession vendors, vending suppliers, and the food and beverage industry [36, 48, 46] and continue to result in recreation environments that support unhealthy eating behaviours. However, if, for example, a provincial policy required healthful beverages and banned single-use plastic bottles, this could prompt the use of another form of packaging for water.

One final yet critical consideration is that the lack of nutrition policy also leaves the determination of what is considered a “healthy” choice open to interpretation from vendors, facility managers, and patrons [48]. During on-site audits, vendors shared a sincere belief that many of the menu options provided were indeed “healthy”, sadly, a belief that was not supported by the evidence. In previous work, the authors heard from adolescent hockey players exposed to the recreation facility food environment that marketing and coaching recommendations gave some foods a “health halo”, further supporting the necessity of objective nutrition classification of the food and beverages within this environment [101].

4.5 STRENGTHS AND LIMITATIONS

This study is the most comprehensive description of the recreation and sport facility food environment in Ontario - the most populous and largest province in Canada - to date. It provides an example of this environment in the absence of policy to provide a comparator from environments with policies (as per Olstad et al. [4]) and as a benchmark for anticipated change. This research is also the first to assess recreation and sport facility food environments across Ontario and the association of single-use plastic water bottle restrictions with the quality of the food/beverage environment. The critique of the siloed approach to environmental policy in the absence of public health considerations gives concrete support for coordinated policy. The study was restricted to volunteer facilities and excluded facilities that had municipal-level nutrition policies in place or plans to implement such a policy for the duration of the study. Nevertheless, we did recruit almost two-thirds of eligible facilities, e.g., those with food concessions operating year-round, though we recognize that this excluded facilities that offered only seasonal concessions. Thus, while the sixteen participating facilities may not be representative of facilities across Ontario, regions across the province were represented, suggesting that unhealthy recreation and sport facility food environments are indeed a provincial issue. Facilities self-selected and, therefore, likely differed in ways that could not be accounted for, other than municipal bottled water policy. Furthermore, there were limitations in the audit process. For example, staff were not blinded to the study design; thus, they may have been aware of the data collection dates, and adjusted offerings. Indeed, one staff member did indicate that this happened. Nevertheless, the predominantly unhealthy offerings suggest that adding or substituting healthy foods was uncommon.

4.6 CONCLUSIONS

In an environment centred on healthy, active living, the prevailing unhealthy food environments in Ontario's municipally funded recreation and sport facilities must be addressed. In the absence of nutrition policy, most food and beverage offerings were energy-dense and nutrient-poor, a finding mirrored in vending packaged food and beverage sales. Moreover, the healthfulness of the food environment was found to be vulnerable to unintended consequences of municipal-level policy banning (single-use, plastic) bottled water, which, ironically, also demonstrated the power of mandated policy. Reducing the availability of convenient, portable water negatively shifted the healthfulness of beverage offerings within facilities in jurisdictions regulating water in single-use, plastic bottles. A mandated nutrition policy approach is recommended at the provincial level to align with public health guidance, to shift the nutrition healthfulness positively, and to support the overall health of those enjoying recreation and sport facilities.

5 DO SUPPORT FACTORS FOR IMPLEMENTING VOLUNTARY NUTRITION GUIDELINES AFFECT THE HEALTHFULNESS OF RECREATION AND SPORT FACILITY FOOD ENVIRONMENTS? EXPERIENCE ACROSS THREE CANADIAN PROVINCES

5.1 INTRODUCTION

Supportive environments are fundamental to shaping healthier food practices [6, 5]. The recreation and sport facility environment, as a setting of regular exposure for many children and adolescents, has the potential to shape norms of behaviour for both physical activity and associated eating practices [7, 13]. Unfortunately, the food-related norms that are strongly associated with this environment are typically unhealthy [8, 13, 12]. There is also evidence that food and beverage sales mirror availability [52, 53, 54, 107] suggesting that recreation and sport facilities are, in fact, promoting unhealthy eating practices by offering predominantly unhealthy options. From this, current recreation and sport facility food environments could be seen as compromising their publicly funded mandate to support health and well-being [50, 48, 17]. Fortunately, recognition that recreation and sport environments, like schools, have the potential to support healthy eating is increasing amongst health professionals and policymakers [14, 15, 16, 17]. Policy action has been identified as necessary to mediate the food environment within this setting [16] and efforts are being made to institute nutrition policy in Canada and elsewhere [2, 67, 68, 108]. With this move toward policy implementation, a critical understanding of implementation supports can guide future action to best advance healthy eating practices within recreation and sports settings. This is especially relevant to Canadian provinces like Ontario that have not yet introduced provincial nutrition policy or guidelines.

Both support systems and capacity have been recognized for some time as critical to efficacious policy or guideline implementation [109, 110]. Leeman et al. [111] define capacity as the ability and motivation to implement interventions. For recreation and sport facilities in regions moving to food policy, implementation capacity is having the relevant infrastructure, appropriate resources, and facility staff who possess relevant knowledge and skills to implement and sustain nutrition guidelines [110, 112]. Capacity-building approaches can increase changes in policy/guideline implementation as well as increase staff knowledge and skills, self-efficacy, and motivation to adopt public health interventions (e.g., food and beverage nutrition guidelines) [110, 112]. Strategies for building such capacity can include training, in-depth consultation, peer networking, coaching, mentoring, providing technical assistance tools, guidance materials, and incentives [113, 112].

The recreation and sport food environment is a complex setting with numerous interacting factors that can affect nutrition policy implementation. We theorized that the implementation factors: guideline mobilization, facility context, and facility-level policy, would interact to effect change. Guideline mobilization is defined as encompassing actions taken to increase implementation of applicable guidelines. Context, while more ambiguous, describes setting conditions and circumstances that the actors and actions work within [114, 109]. Finally, and importantly, we defined facility-level policy as any nutrition relevant policy or contract in place separate from provincial policies. Examples of such policies include contracts with concession food service providers containing a clause related to food healthfulness or policies limiting the sale of less healthy snacks (e.g., chocolate bars) for fundraising activities by facility partners (e.g., sports leagues). Figure 5.1 provides an illustration of the theorized relationship, including

indicators, for each of the factors. Moreover, the degree of implementation affects targeted outcomes [109, 110]. Thus, capacity-building implementation supports specific to guideline mobilization, facility context, and facility-level policy factors can affect the success of implementation and ultimately the healthfulness of the facility food environments. A six-month pilot study by Naylor et al. [40] demonstrated that such a capacity-building intervention supported a robust provincial nutrition guideline implementation within recreation and sport facilities and could impact both organizational capacity and the food environment. However, amongst the supports in the 'tool kit', it is not certain what have been most helpful.

Data for this research were collected as part of Eat, Play, Live (EPL), a population level trial designed to study voluntary nutrition guideline implementation in municipally funded recreation and sport facilities across three Canadian provinces. EPL randomized facilities within the three nutrition guideline provinces (BC, AB, NS) into two groups: one to receive site-specific guideline implementation capacity-building support (GL+CBI) and the other to receive passive support only (GL-ONLY) for an 18-month intervention period. Improved overall healthfulness of the concession food environment, increased self-rated facility capacity, and increased development of facility-level nutrition policy were found with the intervention group (CBI+GL) as compared to GL-ONLY [4]. These positive findings warrant taking a closer look at how the EPL capacity-building intervention supports and strategies impacted guideline mobilization, facility context, and facility-level policy implementation in relation to changes in the healthfulness of the facility food environment within intervention (CBI+GL) facilities. Therefore, the objective of this research was to examine the relationship among the implementation factors: guideline mobilization, facility context, and facility-level policy, and any changes to the healthfulness of

the facilities' food environment to better understand what factors, or combination of factors, impacted any change. Ultimately, this research will help understand process factors that are most likely to support positive nutrition policy outcomes for recreation and sport facility food environments.

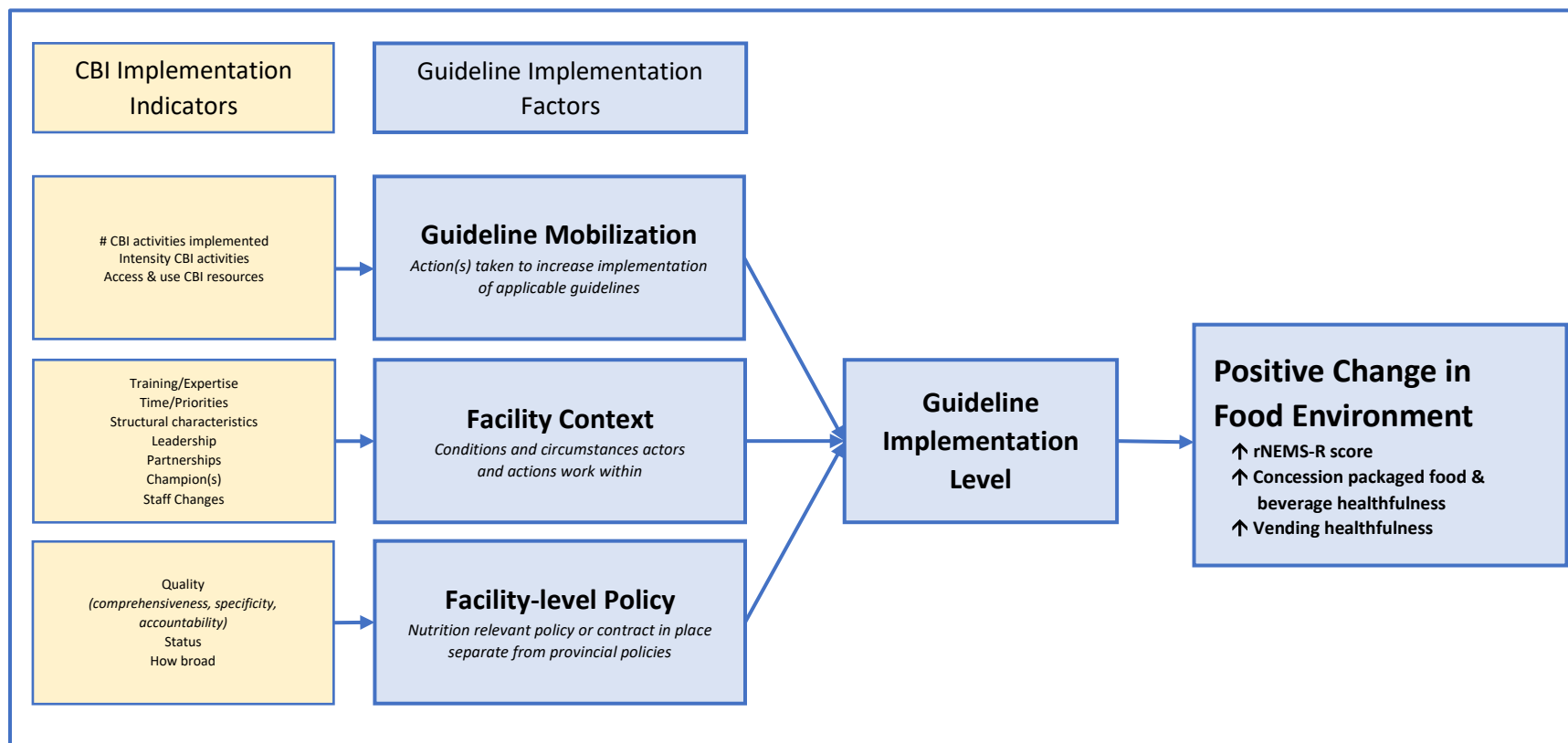


Figure 5.1: Framework illustrating theoretical relationship between CBI Implementation indicators, guideline implementation factors, guideline implementation level, and change in the food environment

5.2 METHODS

Full details of EPL methods are reported elsewhere [39, 4]. Recreation and sport facilities within three provinces (BC, AB, NS) with existing voluntary nutrition guidelines were randomized to an 18-month capacity-building intervention (GL+CBI) or guideline only control (GL-ONLY). The current study only includes data from the 17 facilities randomized to the intervention (GL+CBI) in the three nutrition guideline provinces (BC $n=7$, AB $n=6$, NS $n=4$).

5.2.1 Capacity-building Intervention (CBI)

The capacity-building intervention was guided by the socio-ecological framework using a whole of settings approach and based upon pilot studies conducted by the project lead, P-J Naylor [74, 40, 81, 82]. Guideline implementation support is not “one-size fits all”; a CBI must be tailored to align with the specific needs and context of each facility to be effective [111, 110, 112]. The CBI had a suite of common elements like training and resources, but technical support was individualized to each facility’s goals and needs resulting in a diverse range of goals and activities across contexts. Intervention condition (CBI) protocols are described elsewhere [4] and, along with a detailed breakdown of CBI activities and resources, provided in [Appendix C](#).

5.2.2 Data Sources/Measures

5.2.2.1 Food Environment

An environmental audit was conducted at baseline (T1) and at the end of the 18-month intervention period (T2). This audit included vending beverage and snack profiles, concession packaged beverage and snack profiles, and a concession food environment assessment. Products available at point-of-purchase, were also documented and assessed separately. All packaged products were classified according to the British Columbia Ministry of Health

nutrition profiling scheme [2] to allow comparison across participating provinces. The healthfulness of products was assessed by classifying each as *Sell Most*, *Sell Sometimes*, and *Do Not Sell* to determine the proportion of items that fell within each category.

Concession food environments were measured objectively using an adapted version of the Nutrition Environment Measures Survey-Restaurant reduced item audit (rNEMS-R) [3, 79, 4]. Total scores can range from -4 to +48 for the Fast Casual Summary and -10 to +51 for the Fast Summary, with higher scores indicating greater availability and lower cost of healthy options and support for healthy choices [3].

5.2.2.2 Facility-level Policy Assessment

Information regarding the existence of facility-level food and beverage related policies was collected at baseline and follow-up using purpose-built questions integrated into a self-assessment audit tool adapted to the recreation and sport facility context for use in the British Columbia Healthy Food and Beverage Sales in Recreation Facilities and Local Government (HFBS) initiative [40]. Facility representatives were also asked to provide provincial coordinators with a copy of any existing documented facility-level policy or policies.

5.2.2.3 Implementation Summary

From available documentation, provincial coordinators created an end-of-intervention implementation summary for each facility. This included the implementation plan, a mobilization summary, and a context summary. Implementation plans were documented according to operational area (e.g., vending, food service, programs), healthy choices goals, task, responsibility, and timeline. Implementation mobilization (activities implemented, intensity of activities, access, and use of resources) status updates were documented by

provincial coordinators from monthly check-ins over the 18-month intervention. A facility context data summary (see [Appendix B](#)) was maintained for each facility by EPL Provincial Coordinators. This encompassed baseline and follow-up summaries and documentation of relevant context changes (e.g., changes in concession contractors) across the study period. The implementation summary also included any technical support provided, regional teleconference minutes, interview transcripts (facility representatives were interviewed at the intervention mid-point and again at the end-point), and facility-level policy if applicable. Finally, provincial coordinators also documented the role and level of involvement of the EPL facility representative, guideline implementation buy-in (comments from management, staff, patrons, food/beverage providers, etc.), a summary of where facility efforts were focused, and major challenges and facilitators.

5.2.3 Analysis

Taking an approach similar to Ford et al. [115] with their assessment of state health agency adherence to United State's (US) Institute of Medicine (IOM) recommendations and change in a state's population health status, a Qualitative Comparative Analysis (QCA) and regression analysis were conducted. This approach was taken as both case-oriented and statistical approaches can provide insight. To conduct both analyses, a cross-case analysis was used to assess the implementation factors guideline mobilization, facility context, and facility-level policy, with each facility acting as an independent case. This approach is a systematic cross-case comparison that allows findings to be synthesized while recognizing that each recreation and sport facility is a cluster of conditions that interact together to act on the factors [116, 117]. Taking a multiple case-oriented approach can address necessary and sufficient relationships

within the factors for the defined outcomes while also considering inherent complexities [116, 117]. Using multiple cases also allows an examination of both the similarities and differences across the facilities as well as specific conditions that can lead to the observed outcomes and any relationships between those factors [118]. In contrast, a statistical variable-oriented approach allows an assessment of the inter-relationships between the conditions (factors) and the outcomes of interest [118]. Integrating these approaches allowed a more comprehensive understanding of the relationships between implementation factors and changes to the healthfulness of the recreation and sport facility food environment [118]. Therefore, the QCA examined implementation factor combinations in relation to the healthfulness of facilities' food environment to allow identification of combinations of these factors that could account for achieving the positive change in healthfulness [119]. Regression analysis was used to examine the strengths of relationships between the implementation factors and changes to the healthfulness.

5.2.3.1 Cross-case Analysis of CBI Facilities

Each case facility was rated accordingly for implementation factors Guideline Implementation Mobilization [Mobilization], Facility Context [Context], and Facility-level Policy [Policy] using data gathered from the facility audits and implementation summaries. Facility-level policies were rated for both T1 and T2. These descriptive ratings were used for both the QCA and statistical analyses.

A cross-case analysis team (CCAT) was formed consisting of the EPL national coordinator and one research team member from each province (n=5). Each CCAT member was responsible for reviewing and rating the implementation summary for 10 of the 17 CBI facilities. Raters did not

rate facilities from their home province. Each facility was rated on the factors Mobilization, Context, and Policy by three independent raters. The three raters then met and discussed each rating, coming to consensus on a final rating for each of the implementation factors. These implementation factors (described above and see Figure 5.1) were rated as *Low*, *Low-moderate*, *Moderate*, *Moderate-high*, or *High* using the Implementation Level Scoring Grid (see [Appendix E](#)). Ratings were converted to a numerical score (low = score of 1 and high = score of 5) and a summative Guideline Implementation Level score [Implementation score] out of 15 was also calculated. T2 policy scores were used to calculate the summative Guideline Implementation score.

5.2.3.1.1 Guideline Implementation Factor Indicators

Indicators of guideline mobilization, facility context and facility-level policy, as outlined in Figure 5.1, were used to assess the portfolio of CBI strategies and supports as accessed and implemented by the 17 participating facilities.

Guideline mobilization indicators included the number of CBI activities implemented, the intensity of those activities, and the access and use of CBI resources. For example, a high Mobilization rating indicated multiple goals and numerous activities, some of which were high-impact and high engagement. A moderately-high Mobilization rating, by contrast, indicated some or many CBI goals, some or many activities (although they may not be as in-depth as those required for a high rating), and a moderately high level of engagement.

For the recreation and sport setting, facility context indicators included training and expertise, time allocated, priority placed on guideline implementation, leadership support, structural

characteristics, partnerships, revenue, the presence, absence, and role of any champions, and staff changes. The facility context rating assessed the balance of identified facilitators versus barriers across the various context indicators (See Figure 5.1).

Finally, facility-level policy ratings focused on the positioning of food service contracts relative to healthfulness of food and beverages sold. Assessment was based upon the quality, status, and breadth of existing contracts as well as number of providers and contract variation within the facility (see also [Appendix A](#)). Quality encompassed comprehensiveness (e.g., how restrictive) specificity, and accountability (e.g., monitoring), as well as how closely any policy aligned with the provincial guidelines. Policy status addressed whether there was a policy in place (written or unwritten), under development, partially in place/could be improved or none at all. Breadth assessed the operational areas included (e.g., vending) in any existing policies.

5.2.3.2 Food Environment Change Outcomes

To assess CBI impact on the food environment, changes in vending and concession profiles between T1 and T2 were used. For packaged beverages and snacks sold in vending machines and at concessions, an improvement in healthfulness of the product offerings was defined as a decrease in proportion of products categorized as *Do Not Sell*. This indicated a shift in products into *Sell Sometimes* and *Sell Most* categories and is defined as positive change. For overall concession food environments, increases in rNEMS-R Fast Summary scores were used. The facility with no vending machines was excluded from analyses using vending data. In the rare instances where T2 data was unavailable for any measures, an intent-to-treat approach was used and thus baseline scores were carried forward representing no change.

5.2.3.3 Qualitative Comparative Analysis

A Qualitative Comparative Analysis (QCA) using Tosmana Version 1.61 [120] was conducted to understand influences of the implementation factors (Guideline Mobilization, Facility Context, Facility-level Policy) on increasing food environment healthfulness [119]. As the factor ratings are ordinal (ranging from 1-5), a multi-value qualitative comparative analysis (mvQCA) approach was taken [121]. Outcomes were required to be dichotomous or measured in a way that can be dichotomized for a QCA, therefore for analysis a decrease in *Do Not Sell* for packaged products and an increase in rNEMS-R score was defined as positive change (positive change = Yes or No). QCA analysis uses logical reduction to generate sets of factor combinations, or proposed pathways, to achieve defined outcome(s) [122, 123, 119]. A ‘truth table’, which is a matrix of possible combinations of the implementation factors for each outcome, was produced and then minimized to the set of configurations that could lead to the targeted positive change in healthfulness of offerings [119].

5.2.3.4 Statistical Analysis

Regression analysis using SPSS Version 27.0 [124] was used to assess the relative contribution of the guideline implementation factors for the defined outcomes. The estimated sample size to detect a medium effect size (0.5) in the change in healthfulness measures with 80% power and $\alpha=0.05$ is 36 (G*Power v 3.1) [125]. Therefore, to address both the small sample size ($n=17$), and the possibility of a type 1 error, and the possibility of multicollinearity, bootstrap resampling was used [126].

5.3 RESULTS

Results are based on the 17 facilities randomized to the capacity-building intervention. See Table 5.1 for facility characteristics. Of facilities, 11 had concessions (five had no concession and one had their concession closed during the study window) and 16 had vending machines. Point-of-purchase packaged beverages and snacks were offered at eight of the facilities with concessions. All facilities with vending machines provided beverage vending and 14 also provided snack vending.

Table 5.2 provides a breakdown of indicators that informed the guideline ratings for each implementation factor and examples from facilities achieving higher ratings.

Table 5.1 CBI facility characteristics at EPL baseline

Characteristic	
Facilities by province (<i>n</i>)	
<i>British Columbia</i>	7
<i>Alberta</i>	6
<i>Nova Scotia</i>	4
Community size ^a (% of facilities)	
<i>Small population centre</i>	41.2
<i>Medium population centre</i>	5.9
<i>Large urban population centre</i>	52.9
Facility size ^b (% of facilities)	
<i>Small</i>	23.5
<i>Medium</i>	35.3
<i>Large</i>	41.2
Facilities with concession (<i>n</i>)	11
Facilities with vending (<i>n</i>)	16
<i>Total vending machines</i>	6.2 (range 1-21; $\bar{x}$ = 5)
<i>Beverage vending machines (n=16)</i>	4.1 (range 1-17; $\bar{x}$ = 3)
<i>Snack beverage machines (n=14)</i>	1.8 (range 1-5; $\bar{x}$ = 2)
Facilities with concession & vending (<i>n</i>)	10
^a Classified according to Statistics Canada values and definitions [91, 92]. ^b A small facility had at least one minor or major amenity; a medium facility had at least two amenities, one of which was major; and a large facility had at least three amenities, two of which were major. Major amenities: ice rink, swimming pool, multiple courts (e.g., tennis, squash/racquetball), and theatre (e.g., movie, performing arts). Minor amenities: community and multi-purpose room, fitness room, and small specialty area such as a small climbing wall or gymnastics room.	

Table 5.2 CBI indicators for guideline implementation factor rating

Guideline Implementation Factors	CBI Implementation Indicators	Examples from facilities achieving higher factor ratings
Guideline Mobilization	Number of CBI activities implemented	Ensuring vending products limited to SM & SS ¹ Prominently positioning healthier products in vending machine Updating menu boards to highlight healthy options for patrons Changing default meal sides to healthy option Monitoring and enforcement of contracts or facility policies Using multiple resources (e.g., vending toolkit, policy resources)
	Intensity of CBI activities	
	Access & use of CBI resources	
Facility Context	Training/expertise	EPL ¹ training attendance PHRD ¹ engagement PC ¹ engagement
	Time/priorities	Leadership/management actively prioritizing improved healthfulness
	Leader support	Actioning contract enforcement process Actioning policy development
	Structural characteristics	Pre-existing food service contracts Type & number of food services
	Partnerships	PHRD ¹
	Champion	Facility representative (or staff member) actively supporting improved healthfulness of facility food environment
	Staff changes	Limited staff turnover
Facility-level Policy	Quality	Vending contracts with healthfulness guidelines
	Status	Current contract in place
	How broad	Guidelines not allowing DNS ¹ products in beverage vending machines
¹ Abbreviations: EPL: Eat, Play, Live PHRD: Public Health Registered Dietitian PC: EPL Provincial coordinator SM: <i>Sell Most</i> SS: <i>Sell Sometime</i> DNS: <i>Do Not Sell</i>		

5.3.1 Implementation Factor Ratings in Relation to Positive Changes in Food Healthfulness using Qualitative Comparative Analysis (QCA)

Table 5.3 identifies the proportion of facilities that had positive change (defined as a *decrease* in the proportion of *Do Not Sell* products for vending and concession packaged beverages and snacks and as an *increase* in score for rNEMS-R Fast Summary) for each outcome. When interpreting results, Table 5.3 also summarizes configurations of the necessary and sufficient factor ratings to effect positive change (necessary factor ratings are those that must be present for positive change for an outcome and a factor rating is sufficient if it can result in positive change). For all outcomes, configurations included all implementation factors (Mobilization, Context and Policy), indicating that all factors are necessary at some level to effect positive change.

Examining mvQCA results by outcome, for all packaged beverage and snack outcomes, the configuration with all three factors rated high (score of 5) resulted in positive change. All packaged beverage and snack outcomes also had other factor configurations that were sufficient for change. For Vending Beverage and Snacks, five other configurations emerged as sufficient to reduce the proportion of *Do Not Sell* products. These included a moderately-high (score of 4) Mobilization rating, a moderate (score of 3) Context rating, and a moderate (score of 3) Policy rating. For Concessions to demonstrate a reduction in the proportions of *Do Not Sell* Beverages and Snacks, two other distinct configurations emerged. The first configuration was a high Mobilization rating, combined with a moderate Context rating and moderately-high Policy rating. Alternatively, a moderately-high Mobilization and Policy rating, combined with a moderate Context rating also resulted in a reduction in *Do Not Sell* Beverages and Snacks. For

Point-of-purchase Beverages and Snacks, a high Mobilization rating, combined with a moderate Context rating and moderately-high Policy rating also supported a positive change in the healthfulness of product offerings. For the rNEMS-R Fast Summary, ratings of moderately-high for both Mobilization and Context and a moderate Policy rating were necessary for even the minimal score increases (see Table 5.3) achieved.

When the change in Facility-level Policy rating from T1 to T2 was added to the analysis, the configurations suggest that a *change* in Policy rating was not a necessary factor for positive change for any of the included outcomes. It is important to note that only six facilities had a change in facility-level policy ratings, so data was limited.

Table 5.3 Qualitative Comparative Analysis (QCA) examining implementation factor rating levels in relation to positive change in food environment healthfulness measures

Outcome	Facilities with Positive Change ¹ (%)	Mean Positive Change (% $\pm$ SD)	Factors	Multi-value QCA configuration results ²
Vending Beverages & Snacks <i>Do Not Sell</i>	81.3	-22.6% ($\pm$ 16.9) [-1.6 to -61.1%]	Mobilization, Context, & T2 Policy	Mobilization{5} * Context{5} * T2Policy{5} + Mobilization{4} * Context{3} * T2Policy{5} + Mobilization{4} * Context{3} * T2Policy{3} + Mobilization{5} * Context{3} * T2Policy{4} + Mobilization{5} * Context{4} * T2Policy{4} + Mobilization{4} * Context{4} * T2Policy{3}
			Mobilization, Context, T2 Policy, & Policy Change	Mobilization{5} * Context{5} * T2Policy{5} * PolicyChange{3} + Mobilization{4} * Context{3} * T2Policy{5} * PolicyChange{4} + Mobilization{4} * Context{3} * T2Policy{3} * PolicyChange{0} + Mobilization{5} * Context{3} * T2Policy{4} * PolicyChange{0} + Mobilization{5} * Context{4} * T2Policy{4} * PolicyChange{0} + Mobilization{4} * Context{4} * T2Policy{3} * PolicyChange{1}
Concession Beverages & Snacks <i>Do Not Sell</i>	60.0	-8.4% ($\pm$ 10.7) [-3.8 to -28.4%]	Mobilization, Context, & T2 Policy	Mobilization{5} * Context{5} * T2Policy{5} + Mobilization{5} * Context{3} * T2Policy{4} + Mobilization{4} * Context{4} * T2Policy{3}
			Mobilization, Context, T2 Policy, & Policy Change	Mobilization{5} * Context{5} * T2Policy{5} * PolicyChange{3} + Mobilization{5} * Context{3} * T2Policy{4} * PolicyChange{0} + Mobilization{4} * Context{4} * T2Policy{3} * PolicyChange{1}
Concession Point-of-Purchase	62.5	-18.9% ($\pm$ 20.4) [-1.0 to 50.0]	Mobilization, Context, & T2 Policy	Mobilization{5} * Context{5} * T2Policy{5} + Mobilization{5} * Context{3} * T2Policy{4}

Outcome	Facilities with Positive Change ¹ (%)	Mean Positive Change (% ±SD)	Factors	Multi-value QCA configuration results ²
Beverage & Snacks <i>Do Not Sell</i>			Mobilization, Context, T2 Policy, & Policy Change	Mobilization{5} * Context{5} * T2Policy{5} * PolicyChange{3} + Mobilization{5} * Context{3} * T2Policy{4} * PolicyChange{0}
rNEMS-R Fast Summary	60.0	6.13 (±2.2) [3.1 to 9.4]	Mobilization, Context, & T2 Policy	Mobilization{4} * Context{4} * T2Policy{3}
			Mobilization, Context, T2 Policy, & Policy Change	Mobilization{4} * Context{4} * T2Policy{3} * PolicyChange{1}
Factor Key: Mobilization = guideline mobilization Context = facility context T2Policy = facility-level policy rating at T2 PolicyChange = change in facility-level policy rating T1-T2			Symbol Key: * = combined with + = additional solution(s) that are simultaneously true	
¹ mvQCA positive change outcomes dichotomous: Positive change ‘yes’; Not positive change ‘no’				
² Implementation factor rating level: 1 (low) to 5 (high)				

5.3.2 Implementation Factor Ratings in Relation to Positive Changes in Food Healthfulness using Regression Analysis

Results for multiple regression using Mobilization, Context, and T2 Policy ratings for the proportional change between T1 and T2 healthfulness outcomes (Vending *Do Not Sell* Beverages and Snacks, Concession *Do Not Sell* Beverages and Snacks, Point-of-Purchase *Do Not Sell* Beverages and Snacks, and rNEMS-R Fast Summary score) are shown in Table 5.4. Results for bivariate regression using Guideline Implementation Level score (as per Figure 5.1) and proportional changes in T1 to T2 healthfulness outcomes are shown in Table 5.5. The change in Policy rating from T1 to T2 was added to the models as a second layer of analysis (Tables 5.4 and 5.5).

For Vending Beverages and Snacks, it was found that the three factors in the first model, Mobilization, Context, and Policy were each significantly associated with a decrease in the proportion of *Do Not Sell* products. Likewise, when T1-T2 change in Policy replaced T2 Policy or was added to the model with T2 Policy, the change in Policy was significantly associated with positive outcomes. No significant associations were found for Concessions or Concession Point-of-purchase for Beverage and Snack proportions of *Do Not Sell* items, nor for rNEMS-R Fast Summary scores. The only exception to the above was that Mobilization was slightly but significantly associated with a change to less healthy Point-of-purchase Beverages and Snacks.

The summative Guideline Implementation score (Table 5.5), with or without the addition of the change in policy from T1 to T2 to the model, showed a significant relationship between Implementation Level score and a decrease in the proportion of *Do Not Sell* vending products

but not for concession beverage and snack or point-of-purchase *Do Not Sell* offerings or rNEMS-R scores.

Table 5.4 Multiple Regression analysis examining relationships between implementation factors and proportional change in food environment healthfulness measures

Concession/ Vending	Outcome Variable	Mean ($\pm$ SD)	Model	Independent Variables	Coefficient	p value	Confidence Interval	
							Lower	Upper
Vending	Vending Beverages & Snacks DNS (n=16)	-18.3% (17.7)	Mobilization + Context + T2 Policy	Mobilization	-0.630	0.004*	-0.855	-0.346
				Context	-0.461	0.036*	-0.749	-0.105
				T2 Policy	-0.564	0.011*	-0.863	-0.195
			Mobilization + Context + T1T2Policy Δ	Mobilization	-0.630	0.004*	-0.838	-0.397
				Context	-0.461	0.036*	-0.728	-0.181
				T1T2Policy Δ	-0.656	0.003*	-0.915 ^a	-0.231 ^a
			Mobilization + Context + T2 Policy + T1T2Policy Δ	Mobilization	-0.630	0.004*	-0.832	-0.381
				Context	-0.461	0.036*	-0.760	-0.094
				T2 Policy	-0.564	0.011*	-0.877	-0.179
				T1T2Policy Δ	-0.656	0.003*	-0.945	-0.357
Concession	Concession Beverages & Snacks DNS (n=10)	-4.11 (9.5)	Mobilization + Context + T2 Policy	Mobilization	-0.034	0.462	-0.584 ^a	0.566 ^a
				Context	-0.144	0.346	-0.646	0.278
				T2 Policy	0.329	0.177	-0.505	0.758
			Mobilization + Context + T1T2Policy Δ	Mobilization	-0.034	0.462	-0.655	0.594
				Context	-0.144	0.346	-0.628 ^a	0.279 ^a
				T1T2Policy Δ	0.290	0.209	-0.431	0.674
			Mobilization + Context + T2 Policy + T1T2Policy Δ	Mobilization	-0.034	0.462	-0.454	0.464
				Context	-0.144	0.346	-0.579	0.225
				T2 Policy	0.329	0.177	-0.386	0.723
				T1T2Policy Δ	0.290	0.209	-0.394 ^a	0.675 ^a
		-10.01 (21.1)		Mobilization	0.623	0.027*	0.167 ^a	0.913 ^a

Concession/ Vending	Outcome Variable	Mean (±SD)	Model	Independent Variables	Coefficient	p value	Confidence Interval			
	Concession Point-of- Purchase Beverages & Snacks DNS (n=8)		Mobilization + Context + T2 Policy	Context	0.480	0.080	-0.196 ^a	0.885 ^a		
				T2 Policy	0.469	0.086	0.171 ^a	0.896 ^a		
			Mobilization + Context + T1T2Policy△	Mobilization	0.623	0.027*	0.173 ^a	0.913 ^a		
				Context	0.480	0.080	-0.139 ^a	0.860 ^a		
				T1T2Policy△	0.299	0.201	-0.500 ^a	0.736 ^a		
			Mobilization + Context + T2 Policy + T1T2Policy△	Mobilization	0.623	0.027*	0.069 ^a	0.947 ^a		
				Context	0.480	0.080	-0.231 ^a	0.897 ^a		
				T2 Policy	0.469	0.086	-0.278 ^a	0.904 ^a		
				T1T2Policy△	0.299	0.201	-0.500 ^a	0.718 ^a		
			NEMS Fast Summary Score (n=10)	2.35 (3.9)	Mobilization + Context + T2 Policy	Mobilization	-0.119	0.371	-0.841 ^a	0.755 ^a
						Context	0.040	0.456	-0.694	0.782
	T2 Policy	-0.513				0.065	-0.832	-0.035		
	Mobilization + Context + T1T2Policy△	Mobilization			-0.119	0.371	-0.956	0.943		
		Context			0.040	0.456	-0.675	0.784		
		T1T2Policy△			-0.300	0.200	-0.794 ^a	0.407 ^a		
	Mobilization + Context + T2 Policy + T1T2Policy△	Mobilization			-0.119	0.371	-0.795	0.748		
		Context			0.040	0.456	-0.594	0.750		
T2 Policy		-0.513			0.065	-0.852	0.167			
T1T2Policy△		-0.300			0.200	-0.758 ^a	0.081 ^a			

Reporting bootstrap with bias corrected adjustment, 2000 samples, 95% CI

* *p*<0.05

^a Based on 1999 samples

Table 5.5 Bivariate Regression analysis examining relationships between Implementation Score and proportional change in food environment healthfulness measures

Conc/Vend	Outcome Variable	Model	Mean (±SD)	Coefficient	Standard Error	p-value	CI Lower	CI Upper
Vending	VendBevSnDNS (n=16)	Implementation Score	8.13 (3.575)	-3.142	1.050	0.010*	-5.051	-1.302
		Implementation Score with ΔT1T2Policy	8.13 (3.575)	-2.934	0.941	0.009*	-4.763	-0.993
Concession ¹	ConcBevSnDNS (n=10)	Implementation Score		0.279	0.958	0.728	-0.857	2.849
		Implementation Score with ΔT1T2Policy		0.384	0.687	0.567	-0.648	19.74
	ConPOP DNS (n=8)							
	NEMS FS Δ Score (n=10)	Implementation Score		-0.282	0.453	0.444	-1.165	1.108
		Implementation Score with ΔT1T2Policy		-0.247	0.312	0.334	-0.705	0.507
	*p<0.05							
	¹ Statistics for ConPOP DNS could not be computed due to fewer facilities offering POP (n=8)							

5.4 DISCUSSION

The Eat, Play, Live (EPL) Capacity-building intervention (CBI) provided supports targeting specific implementation factors including guideline mobilization, facility context and facility-level policy. This intervention improved the adherence to provincial voluntary nutrition guidelines and thus healthfulness of the facility food environment within 17 publicly funded recreation and sport facilities across three Canadian provinces, relative to non-intervention control facilities [4]. The current analysis aimed to determine aspects of the intervention that were most helpful in order to direct supports for jurisdictions implementing nutrition guidelines or policy in the future. The Qualitative Comparative Analysis (QCA) demonstrated relationships among the implementation factors resulting in positive change. The multiple regression analysis further identified the strength of the implementation factors in relation to the healthfulness of foods offered for sale, most notably in vending machines. Both the QCA and the regression analysis showed that all three guideline implementation factors and, importantly, the rating level of those factors matter to healthy positive change in this setting.

QCA analysis is based upon the assumption that complex issues can be impacted by a combination of factors that may result in multiple configuration pathways that effect change [122, 123, 119] and the multi-value QCA allowed the degree to which factors must be present [127, 128]. Broadly, our mvQCA results showed relative consistency with the configurations and the minimum ratings levels necessary to support change for the three factors. The necessary factor relationships highlight the complex inter-relationships between the three factors and affirms individual implementation factors do not work in isolation. Recreation food facilities can use the relationships identified between the three factors to guide intervention strategies

targeting indicators of capacity to implement nutrition guidelines. First, however, it is important to understand what achieving the necessary rating levels for each factor translated to in terms of the CBI implementation within facilities and how these findings can be used to support implementation efforts moving forward.

5.4.1 Guideline Mobilization

Of the three guideline implementation factors, Mobilization emerged as especially important. mvQCA configurations containing Mobilization ratings of high or moderately-high were necessary. Mobilization was also the most significant factor associated with positive healthfulness on regression analysis with a strong association between Mobilization and decreased *Do Not Sell* Beverages and Snacks in both Vending and Concession Point-of-purchase. Mobilization examples from facilities receiving high or moderately-high ratings included having scheduled monitoring of vending machine products and requiring removal of *Do Not Sell* products, identifying healthier options on menu boards or in vending machines, prominently positioning healthier options (e.g., Point-of-purchase, centre rows of vending machines), and adding new and healthier options to concession menus. Taking such actions made important changes to the food offerings and indicate that implementation supports targeting these and similar actions to ensure the higher levels necessary can have a strong impact. Of the actions identified, two groups of action stood out as being particularly important for change: choice architecture approaches, or nudging as it is also called, and monitoring and enforcement of existing contracts and/or facility policies.

Choice architecture has been defined as:

“Interventions that involve altering the properties or placement of objects or stimuli within micro-environments with the intention of changing health-related behaviour. Such interventions implemented within the same micro-environment as that in which the target behaviour is performed, typically require minimal conscious engagement, can in principle influence the behaviour of many people simultaneously, and are not targeted or tailored to specific individuals” [129, p. 3]

This approach can include positioning (e.g., fruit versus candy bars at point-of-purchase; removing sugar-sweetened beverages from line of site), including information to trigger choices (e.g., identification cues for healthier options on menus such as symbols or stop-light labelling; provision of health information) and changes to defaults (e.g., salad versus fries as the standard side) [130, 131]. One of the benefits of this approach is alignment with making ‘the healthy choice the easy choice’ [15]. A review looking at the effect of positional changes found that a positive effect on food choice for 16 of 18 studies reviewed [131]. For the two studies reviewed with no change, less healthy options remained within reach, indicating proximity was an important factor [131]. Another aspect of choice architecture is making choosing less healthy choices more difficult [130]. A study looking at removing least healthy beverages (‘red’ drinks) from display versus limiting them found that while both led to a reduction in the sale of the ‘red’ beverages, the off-display group was more successful with a 20% versus 8% reduction in sales [132]. In a similar study, looking at reducing the display of least healthy (‘red’ drinks), display of ‘red’ beverages declined 17% and sales declined 19% [54]. Further evidence of the benefits of using cues or prompts for patrons came from a study using traffic light approach

(green=healthier option; red=least healthy option) to labelling concession menus in recreation and sport facilities; the sale of 'green' options increased 52-55% and sale of 'red' items declined 27-30% with no change in revenues across the intervention period [98]. Research investigating a nudge intervention in two Dutch sports canteens found that sales of nudged products increased 87-139% per week from baseline across the intervention period (16 and 26 weeks respectively) [133]. Our findings combined with other research findings suggest that greater attention to menu labelling and positionality approaches could contribute to meaningful change in this food environment.

Choice architecture can be an especially important approach in settings with voluntary nutrition guidelines as strategically positioning items to influence food choices does not create the perception of challenging patron autonomy. Perceived threats to autonomy emerged as a barrier to concession changes for some EPL CBI facilities (see [Chapter 6](#)). Choice architecture allows the opportunity to influence behaviour without restricting choice [130]. In the Dutch sports canteen study, van Rookhuijzen et al. [133] found that both stakeholders and most facility visitors agreed nudges were an acceptable approach to influencing eating behaviour in the canteen [133]. Further, a survey assessing acceptability of interventions targeting behaviour change found nudge approaches to be acceptable to 78% participants [134]. Therefore, placing a strong focus on choice architecture as an implementation approach for improving voluntary guideline alignment has the potential to support a healthier food environment.

One final consideration for choice architecture is the use of menu defaults, such as the change made by one facility to use whole wheat bread as the default. Not only do such strategies make choosing healthier options easier, they also send a message; it signals what is "reasonable and

acceptable” [130]. Thus, these subtle changes may also contribute to the evolution of food norms within the recreation and sport facility setting.

An important mobilization action taken was monitoring and enforcement of existing contracts and agreements. This extended to facility-level policy and also relied upon facility context factors being in place such as structural factors like food service contracts with healthy choice stipulations specified within them and leadership support for staff to take on monitoring and enforcement. Designating responsibility for such action could also prove useful, as actioning contract enforcement was documented as being prompted by facility leadership or a facility champion. Undefined roles around implementing nutrition policy has been identified in the implementation literature as an important barrier [135]. Therefore, for facilities in a position to enforce such contracts/policies, identifying clear roles and responsibility and having access to resources to guide monitoring and enforcement approaches could optimize the benefit of existing contract and policy supports.

5.4.2 Facility Context

Context ratings captured the balance of facilitators and barriers across indicators affecting CBI implementation at the facility level. In particular, facilities with higher context ratings engaged with expertise available to them such as a public health dietitians and EPL Provincial Coordinators; had facility representatives who did not change during the CBI and thereby benefited from the initial training provided; had leadership that prioritized improving facility food environment; had fewer structural barriers, such as existing contracts that allowed providers to offer unhealthy choices; and, some, had a champion to support guideline implementation. These findings align with research identifying implementation facilitators and

barriers [136, 137, 12, 13]. Implementation supports that target the provision of training and expertise, priority issues, and structural barriers could, in turn, support increased mobilization activities and policy development. What stood out as indicators that offered greater opportunity for nutrition guideline implementation support action at the facility level were training and expertise, and leadership or management that prioritized change in facility food healthfulness.

5.4.2.1 Training and expertise

A 2019 review looking at factors influencing nutrition policy implementation in schools found that training support was critical, and that lack of knowledge and skills was a barrier found across many of the studies [135]. This aligns with our findings that facilities achieving higher context ratings often had facility representatives who benefited from the initial EPL training and engaged with the local PHRD (as expert support). Expert support and training have both been identified as essential in implementation research in recreation and sport facility and school settings [13, 138, 136]. In a review of effectiveness of capacity-building interventions DeCorby-Watson et al. [112] found that training and workshops resulted in improved knowledge, skills, and knowledge applications. However, in a review of community-based implementation trials, Wolfenden et al. [139] found that educational meetings were the implementation strategy employed most, yet the heterogeneity across content and delivery was problematic for identifying the most effective approaches for further implementation efforts. Further, an evaluation of an intervention to build implementation capacity conducted by Mosson et al. [140] found that organizational context and participant characteristics were important considerations. This suggests that interventions, like the CBI of EPL, would benefit from

expanding from one common training approach to a range of training approaches tailored to context. Further, extending training opportunities could also support implementation sustainability by addressing staff and management changes, the multiple-levels of stakeholder involvement, skill development, and awareness and understanding of available resources. Ensuring all implementation actors receive the benefit of initial training as well as a range of continuing training opportunities could contribute to increased guideline uptake. Finally, this also highlights an opportunity for future intervention approaches to assess various training strategies and clearly define those that are the most effective within the recreation and sport facility environment.

5.4.2.2 Prioritizing food environment healthfulness

Prioritizing changes to the healthfulness of the food environment was also an important feature documented for those facilities achieving higher context ratings. Competing priorities was a challenge identified in several facilities, emerging as a stronger barrier for those facilities with lower context ratings. This is not surprising, as competing priorities have been identified as an important barrier across implementation literature for recreation and sport facility [12, 137] and school environments [135] as well as in other settings [141, 142].

An important aspect of prioritizing food environment healthfulness is recognition of recreation and sport facilities as a health promoting setting. When exploring improving Flemish sports clubs' health promotion orientation, Meganck et al. [75] recommended putting emphasis on positive reasons for doing so, such as population health contributions and increased performance. The negative impact of unhealthy food options on high performance adolescent hockey players in sport was highlighted by research in Ontario recreation and sport facilities

[101], suggesting this is indeed a leverage point that could be mobilized. Focusing attention of how healthy eating fits with the active living mandate of recreation and sport facilities could help shift priorities towards a healthier food environment.

Leadership buy-in to health promotion is also an important facility context factor in prioritizing improved food environment healthfulness and implementation actions in the current research.

In a study looking at stakeholder perspectives on implementation of nutrition guidelines in publicly funded institutions in Victoria, Australia, management level prioritization of nutrition guideline implementation was also found to be an important facilitator [136]. Leadership buy-in has been identified as a facilitator across the implementation literature [143, 144, 142, 136].

For example, McIsaac et al. [135] found that having strong advocates among leadership or champions was an important facilitator for implementation of nutrition guidelines. So, it is not surprising that the presence of a champion was also a determinant for some facilities with higher context ratings. Therefore, supporting a range of actors at the facility context level is an opportunity to tip the balance towards nutrition change.

Finally, supportive leadership was also identified as important to policy development in research looking into healthy food and beverage policies in government-owned facilities in Victoria, Australia [143]. This highlights the inter-relationship between context and facility-level policy, suggesting that while the guideline mobilization actions had to be at a high level, the support from context determinants was critical to allowing the activities that impacted change to take place.

5.4.3 Facility-level Policy

One of the actions across many of the facilities with higher mobilization ratings was monitoring and enforcement of existing policy (either facility-level policy or contract requirements, or both). This highlights the importance of having policies/contracts in place that allow enforcement. Attention to healthier food stipulations in contracts moving forward may support opportunities for further mobilization activities. Food service contracts that did not support healthier options generally served as barriers to change in other research as well [145, 136, 13], whereas those contracts with requirements for healthier options facilitated guideline implementation. Stakeholders in a study of their perspectives on implementing nutrition policy in publicly funded institutions identified including healthy nutrition contractual obligations as a key facilitator to overcoming guideline implementation barriers [136]. Further, in a 2023 review of barriers and facilitators to implementing healthy food and beverage policies in public sector workplaces (e.g., healthcare facilities, recreation centers, government agencies) authors suggested voluntary policy may hinder implementation and that without healthy food and beverage contract clauses there is no basis to enforce such policies [146]. The inability to enforce voluntary provincial guidelines without contractual obligations for healthier options was a challenge across many of the EPL CBI facilities [49].

Vending in particular benefited from the combined effect of enforcing existing vending policy and policy change action. The proportional change in improved healthfulness was noticeably higher for vending ($-18\% \pm 18$ *Do Not Sell* packaged beverages and snacks) compared to concession outcomes ($-4\% \pm 10$ *Do Not Sell* packaged beverages and snacks) and the regression analysis demonstrated that the guideline factors were independently and collectively

significantly associated with the vending change. Importantly, the regression analysis also found a significant relationship between policy rating change between T1 and T2 and the proportional change of Vending Beverage and Snack *Do Not Sell* products. When taken together, the analysis suggests that policy change is indeed important, but also that policy must be monitored and enforced to effect change. Only six facilities had a change in facility-level policy ratings between T1 and T2, however, findings suggest that vending is an area responsive to change. Since vending is the only food service option available to patrons at all times when facilities are open, and showed greater impact from the CBI, it may be a good starting point for facilities looking to improve healthfulness of facility food offerings.

Finally, while our findings clearly support the effectiveness of having nutrition policy/contract requirements they also align with research identifying monitoring and enforcement as crucial aspects of implementation [135, 147]. Interestingly the literature also indicates that monitoring and enforcement is a challenge [135, 148, 136]. As such, context plays an important role, reinforcing the inter-relationship of implementation factors.

5.4.4 Strengths & Limitations

This study has several strengths. First is the use of QCA analysis which allows analysis of complex and varied inter-relationships. QCA also allows for analysis of a small number of cases. A further strength is the use of a cross-case analysis approach to assess and rate guideline mobilization, facility context and facility-level policy using mixed-methods data sources. Both the inclusion of multiple data sources and the multiple ratings from provincial coordinators from different provinces than where facilities were located, reduced potential bias. While

statistical analysis was used to provide further insight into implementation factor relationships, the small number of cases was a limitation.

Although, this study includes facilities across three Canadian provinces, representativeness of facilities may be limited by study requirements such as having a number of sports areas rather than just a single arena or pool. EPL participant facilities were randomized to the CBI group, however, they did self-select study participation which could indicate a pre-existing interest in improving healthfulness of the food environment. However, generalizability to other jurisdictions may be supported given the multiple provinces represented, the range of sizes and types of facilities participating and the real-world design.

5.5 CONCLUSIONS

This study contributes a better understanding of process factors supporting nutrition guideline implementation. QCA was a useful approach, demonstrating the relationship between factors influencing guideline implementation. Higher ratings (moderate and above) of all three guideline implementation factors (Mobilization, Context, and Facility-level Policy) were necessary to support changes in recreation and sport facility food environments highlighting that implementation support approaches must pay attention to all three to effect change.

Higher guideline Mobilization ratings were necessary suggesting that efforts supporting the number and intensity of mobilization activities such as monitoring and enforcement of existing food service contracts and food choice architecture approaches could have the greatest impact on food environment healthfulness. Yet Mobilization actions did not take place in isolation.

Higher levels of Context and Facility-level Policy were also necessary in combination with the

higher Mobilization ratings and played a pivotal role in allowing mobilization activities. Thus, attention to strategies focused on training, expertise, prioritizing change, addressing structural barriers, developing leadership buy-in and establishing facility-level policy can further support nutrition guideline implementation. This research provides important insight for those implementing nutrition guidelines in recreation and sport settings as well as for policy makers and researchers. It is important that all interventions be planned with a clear understanding of both the complexity and relationships between factors and their effect on implementation activities.

6 LESSONS LEARNED FROM A CAPACITY-BUILDING INTERVENTION TO SUPPORT VOLUNTARY PROVINCIAL NUTRITION GUIDELINE IMPLEMENTATION IN CANADIAN RECREATION AND SPORT FACILITIES: A MULTIPLE-CASE STUDY

6.1 INTRODUCTION

In Canada and elsewhere food is an integral part of most recreation and sport facility settings [13]. Unfortunately, these food environments are typically unhealthy [13, 39, 8, 10, 42, 43]. The influence of food environments in promoting dietary patterns that support health is well-established [36, 37, 38, 15, 6]. Policy action has been identified as necessary to mediate the food environments within this setting [16]; however, to date, no Canadian province has mandated nutrition standards for municipally funded recreation and sport facilities. British Columbia, Alberta, and Nova Scotia have all implemented voluntary nutrition guidelines [67, 2, 68]. Yet, uptake has been poor [8, 39, 41]. These voluntary guidelines set out minimum nutrition standards for food and beverages offered for sale in vending machines and at concessions, but the absence of compliance monitoring underscores that development and dissemination alone may not translate in adoption and implementation. Even with mandated nutrition policy, as with Ontario, Canada's School Food and Beverage Policy (P/PM 150), adoption can be challenging and maintaining change uncertain in the absence of compliance monitoring [148]. A better understanding of how to best support policy implementation to accomplish meaningful Improvements in recreation and sport facility food environments is needed.

Leeman et al. [111] cite lack of capacity to adapt and implement an intervention as one reason interventions are not adopted. The term ‘capacity-building’ has been defined as any strategy or combination of strategies designed to increase ability and motivation to adopt an intervention [113]. A 2015 review looked at the range, variations, and effectiveness of capacity-building strategies to implement community-based interventions [110]. A later (2018) systematic review looked at the effectiveness of capacity-building interventions (CBI) relevant to public health practice [112]. Both reviews found that CBIs were effective at increasing implementation of public health interventions [110, 112]. The research found that CBIs can enhance knowledge, skills, self-efficacy, behaviour change, and system level capacity [112, 110].

Leeman et al. [110] also found that the type and structure of capacity-building strategies may influence effectiveness and that variations may be required based on contextual factors. In a follow-up review used to develop a theory to guide implementation capacity, the group posited that capacity-building effectiveness is moderated by both the intervention and context [111]. Further, DeCorby-Watson et al. [112] found that multi-component CBIs did enhance knowledge and skills, yet which key components contributed most to the impact on capacity was not reported. This highlights the importance of assessing the influence of specific CBI components, or combinations of components, on the outcomes of public health interventions.

This research is positioned within the Eat, Play, Live (EPL) study of voluntary nutrition guideline implementation within municipal recreation and sport settings in the three Canadian provinces [2, 67, 68]. EPL tested a ‘real world’ CBI to promote implementation of voluntary nutrition guidelines in a community setting. The 18-month CBI had an impact on the uptake of provincial nutrition guidelines in facilities randomized to the intervention condition (guideline+CBI) versus

guideline-only control facilities [4]. This resulted in a healthier food environment in those facilities that received capacity-building support when compared to control facilities that offered only passive support resources and also when compared to facilities in a province with no nutrition guidelines [4]. The improvements, while modest, suggest this is an avenue for action. Yet, EPL and similar studies have found that there can be barriers to capacity building, indicating that understanding when, where, and how to implement a CBI is important to its success [48, 41, 75]. To clearly define 'lessons learned' from EPL's CBI and support future community-based policy implementation efforts, further evaluation of the CBI findings was needed.

Damschroder and colleagues' [149] Consolidated Framework for Implementation Research [CFIR] has been used extensively to guide intervention implementation analysis and has a growing evidence base in public health research [150, 151, 152, 142, 153, 154, 155, 156]. Developed in 2009 [149] and updated in 2022 [1] informed by experienced users' feedback, the framework consolidates constructs from relevant existing implementation theories to promote consistent terminology, definitions and taxonomy, and to support implementation effectiveness. As a determinant framework, CFIR can be used to retrospectively assess factors that contributed to implementation outcomes and to thereby distill 'lessons learned' [157].

The objective of this study was to describe and frame relationships between and among the CBI components as implemented and changes to the healthfulness of the food environments in recreation and sport facilities participating in the EPL intervention. We used a multiple-case approach which allows an examination of the observed impact and strategy variation of the CBI across different facility contexts [117, 110] to discern the factors that contributed to success or

lack thereof. Therefore, we compared and contrasted facilities that achieved greater success in increasing the healthfulness of the recreation and sport facility food environments (as a proxy for provincial nutrition guideline uptake/implementation) with facilities who were less successful at effecting change. Analysis results were mapped onto the updated CFIR [1] domains and constructs to evaluate and identify lessons learned. Findings were used to develop recommendations to support guideline implementation moving forward. Ultimately, this research can assist other jurisdictions in building capacity to enhance implementation of nutrition guidelines in recreation and sport facilities.

6.2 METHODS

Data for this multiple-case study were collected as part of Eat, Play, Live (EPL), a nutrition policy intervention trial that examined recreation and sport facility food environments in four Canadian provinces. Recreation and sport facilities in British Columbia, Alberta, and Nova Scotia which all had voluntary nutrition guidelines for municipally funded recreation and sport facilities were randomized to an 18-month capacity-building intervention or a guideline only control condition. Ontario facilities, with no provincial guidelines, were positioned as a second control group - a no-guideline comparison condition. Full details of EPL methods and CBI are described elsewhere [39, 4].

6.2.1 Sample

For this study, four case facilities were included from the 17 facilities across British Columbia ($n=7$), Alberta ($n=6$), and Nova Scotia ($n=4$) that received the CBI to support voluntary provincial nutrition guideline implementation. Facilities were eligible for this multiple-case study if they offered both vending and concession food service and had complete audit data (11 of 17 CBI

facilities met criteria). Case facility selection was calculated using a two-tail design to include both similar and contrasting outcomes [116]. Four case facilities were chosen to represent the most (n=2) and least successful (n=2) in effecting improvements to the healthfulness of facility food environments in response to the CBI with consideration also given to provincial representation.

Outcomes of food environment audits were ranked based on changes to outcome measures between CBI baseline (T1) and follow-up (T2). The following nine outcomes were used: concession scores (the Nutrition Restaurant Environment Measures Survey – Restaurant reduced item audit (rNEMS-R) [3]), proportions of both *Do Not Sell* and *Sell Most* available for sale for each of concession packaged beverages and snacks, and proportions of *Do Not Sell* and *Sell Most* available for sale for each of vending beverages and snacks. *Sell Most*, *Sell Sometimes* (outcome not included), and *Do Not Sell* were classified according to the British Columbia Ministry of Health nutrition profiling scheme [2].

Positive change was differentiated as *High* (above the median change for all eligible facilities) or *Low* (between +1.0% and the median change¹). Change between -1.0 and +1.0% was defined as *No Change* and was further differentiated as remaining *Healthy* or *Unhealthy* depending on whether offerings met provincial guidelines or not. *Negative* change was defined as any change below -1.0%.

¹ If median was between -1.0% and +1.0%, *Low Positive* change was not applicable (no medians below -1.0%)

6.2.2 Capacity-building Intervention (CBI)

The CBI was individualized to the specific goals and needs of each facility with facilitated goal setting for each facility based upon baseline assessment. Protocols are described in detail elsewhere [4] and see [Appendix C](#).

6.2.3 Data Profile

Data used to evaluate the CBI were drawn from facility-specific CBI implementation summaries as described below.

6.2.3.1 *Implementation Summaries*

EPL Provincial Coordinators (PCs) created an implementation summary for each facility at the end of the CBI which included:

1. Assessments of facility capacity to support the provision and promotion of healthy food options as per provincial guidelines at T1 and T2 using a self-assessment tool (described in detail elsewhere [39, 4]).
2. Summaries of responses to questions integrated into the above questionnaire to assess facility-level food and beverage policies as well as the contents of any available facility policy documents.
3. Facility implementation plan documenting planned operational action areas, goals, tasks, and any plan updates (scheduled at 6 and 12 months).
4. An implementation mobilization summary documenting status updates including activities implemented, intensity of activities, and use of EPL resources.
5. A summary documenting relevant context changes (e.g., change of concession contractor) across the intervention period.
6. Minutes from quarterly regional teleconference calls.
7. Technical support provided by PCs via telephone, email or teleconference interactions.

8. Documentation of the role and level of involvement of the EPL facility CBI Lead (facility representative), guideline implementation buy-in (comments from management, staff, patrons, food/beverage providers, etc.), a summary of where facility efforts were focused, and major challenges and facilitators compiled by EPL Provincial Coordinators.
9. Transcripts from interviews conducted with facility CBI Leads (facility representative) at the mid-point and end of the intervention.

6.2.4 Analysis

Analysis for this multiple case study used both deductive and inductive approaches guided by Stake [117] and Yin [116] methodology. An initial list of potential themes relevant to the EPL CBI was defined *a priori* based on standard headings within the above implementation summary documentation (e.g., partnership, policy, revenue). The codebook to guide the analysis was next extended and refined with careful review of implementation summaries and facility CBI Lead interviews from the CBI facilities that were not selected as case facilities (n=13) to identify additional themes. Guided by these potential themes, the first cycle of analysis with documents pertaining to the four case facilities, identified findings and extended the codebook to include any new emerging themes and sub-themes. The next cycle refined the analysis to determine the prominence, relevance, and utility of identified themes for each of the four cases [117]. Findings were then synthesized and positioned within the domains and constructs of the updated Consolidated Framework for Implementation Research (CFIR) [1]. The CFIR is comprised of five domains: Innovation; Outer Setting; Inner Setting; Individuals; and Implementation Process, with two subdomains for the Individuals domain (Roles and Characteristics) and seven to 13 constructs per domain (Figure 6.1) [1]. Together these provide an overarching framework that can be adapted to encompass factors essential to both effectual

implementation of any public health intervention and to multiple contexts. For the final analytical step, we identified which CFIR constructs and sub-constructs were distinguishing between the More and Less Successful case facilities and mapped the themes and associated findings onto these constructs.

Analysis was supported with NVivo Version 14 [83] and IBM SPSS for Windows (Version 27, IBM Corp. Armonk, NY) [124].

6.2.4.1 Analytical Rigour

Triangulation with multiple data sources was used to support the reliability of findings [117, 116, 158, 76]. To reduce potential bias, interviews were conducted by an arms-length EPL coordinator from a different province (protocols described elsewhere [49]) [118]. As a further measure of reliability, a member of the EPL research team familiar with the data cross-checked the coding for one case. Any disagreements were discussed to achieve consensus [118]. As a check on the analysis process and to enhance validity and dependability, more extensive peer debriefing was used, where members of the EPL research team reviewed the results and interpretation [158]. To corroborate interpretation of findings and support credibility, exemplar quotations from CBI Leads and provincial coordinators are provided [158, 116, 118]

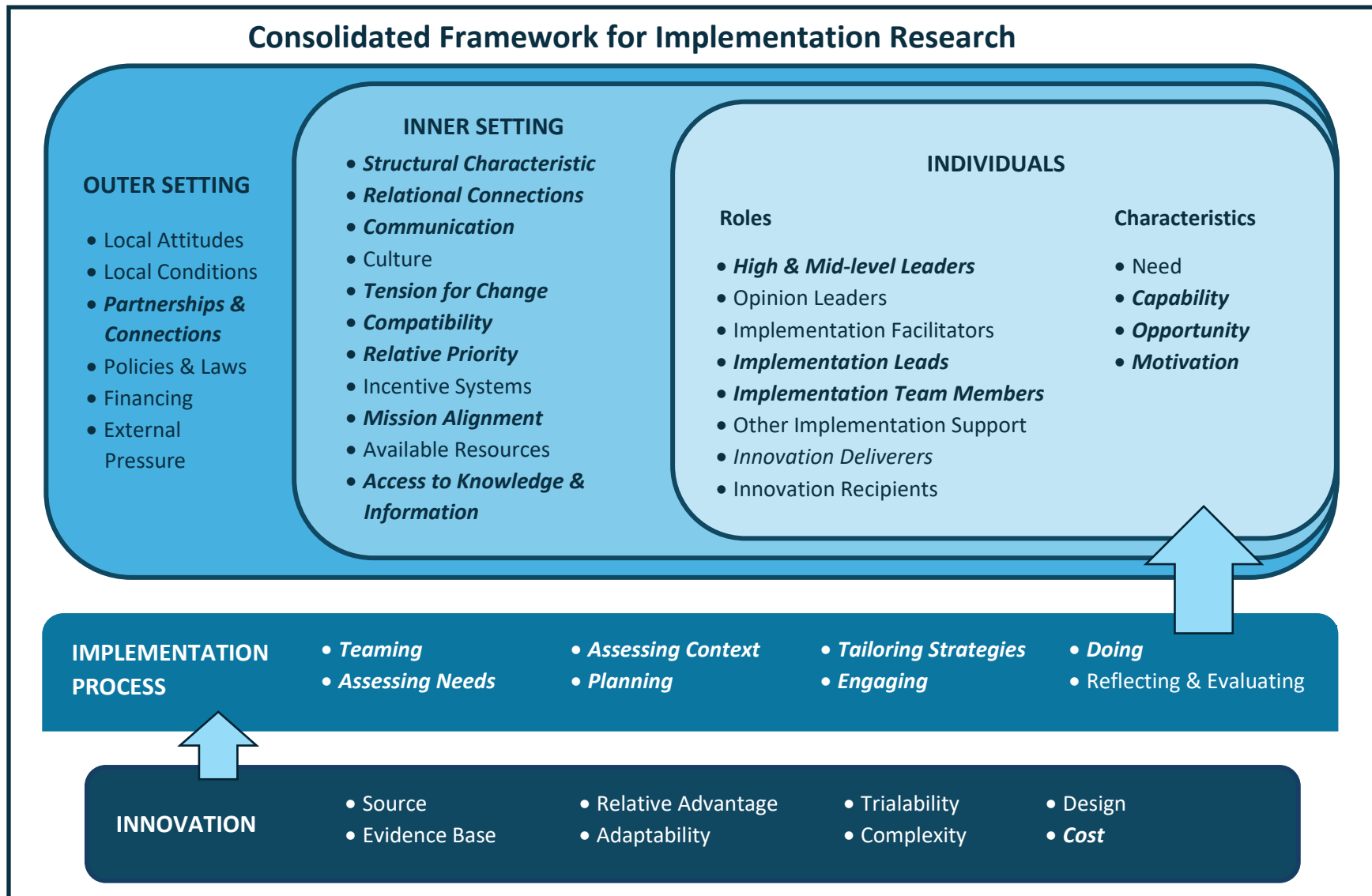


Figure 6.1:Consolidated Framework for Implementation Research (CFIR) adapted from Damschroder 2022 [1];

[Distinguishing construct legend: Bold italicized = Distinguishing; Italicized = Mixed results among More vs Less Successful]

6.3 RESULTS

From facility rankings, two recreation and sport facilities in each of British Columbia and Alberta were chosen for the case study analysis: one each of More and Less Successful for each province. The four facilities were comparable across both facility amenities and community size. Case facility characteristics can be found in Table 6.1.

Overall, the CBI resulted in significant improvements [4], though no facility, including facilities meeting case study eligibility, had met provincial nutrition guidelines for recreation and sport facilities at the end of the intervention across all concession and vending outlets. All four cases were able to make improvement across multiple outcomes; however some were more successful at changing food offerings in a positive direction. Across all four facilities, positive change was achieved for two to six of the nine food environment outcomes per facility. All facilities also had outcomes with no change (range 1-6) and negative results for some outcomes. All four facilities achieved positive change with *Do Not Sell* vending snacks (range 4.6% - 75.5% decrease). Change by facility is summarized in Table 6.2.

The process of provincial nutrition guideline implementation as supported by the EPL CBI and the thematic analysis of results is described for the More versus Less Successful facilities using the updated CFIR [1]. Between the More and Less Successful facilities, of 49 CFIR constructs and sub-constructs assessed, 24 were distinguishing, 23 were not distinguishing, and two were mixed. Table F.1² ([Appendix F](#)) provides a detailed analysis summary of the themes/factors organized by CFIR [1] domains, constructs and sub-constructs. The following sections describe

² Positioned as an appendix due to table size.

the differences and similarities across the four facilities organized according to the five CFIR [1] domains and themes/factors assessed.

Table 6.1 Facility Characteristics

Characteristic	Case Facilities	Eligible CBI Facilities
Facilities by province (<i>n</i>)		
<i>British Columbia</i>	2	5
<i>Alberta</i>	2	5
<i>Nova Scotia</i>	0	1
Community size ^a (# of facilities)		
<i>Small population centre</i>	2	4
<i>Medium population centre</i>	0	1
<i>Large urban population centre</i>	2	6
Facility size ^b (# of facilities)		
<i>Small</i>	0	1
<i>Medium</i>	2	4
<i>Large</i>	2	6
Vending (mean # per facility; range)		
<i>Total^c Vending Machines</i>	9.00 (3-15)	7.73 (1-21)
<i>Cold Beverage</i>	5.25 (2-11)	4.36 (1-12)
<i>Snack</i>	2.75 (1-4)	2.27 (0-4)
^a Classified according to Statistics Canada values and definitions [91, 92]. ^b A small facility had at least one minor or major amenity; a medium facility had at least two amenities, one of which was major; and a large facility had at least three amenities, two of which were major. Major amenities: ice rink, swimming pool, multiple courts (e.g., tennis, squash/racquetball), and theatre (e.g., movie, performing arts). Minor amenities: community and multi-purpose room, fitness room, and small specialty area such as a small climbing wall or gymnastics room. ^c Includes cold beverage, snack, hot drink, and frozen vending machines.		

Table 6.2 Case Facility Outcome Summary

Facility	Positive Change			No Change			Negative Change
	High	Low	Total	Healthy	Unhealthy	Total	
MS 1	5	1	6	0	1	1	2
MS 2	5	0	5	0	2	2	2
LS 1	1	1	2	0	5	5	2
LS 2	1	2	3	0	6	6	0
MS: More Successful LS: Less Successful							

6.3.2 I: Innovation Domain

British Columbia and Alberta adopted provincial nutrition guidelines for recreation and sport facilities (the innovation in this analysis) in 2014 and 2012, respectively [2, 67]. Even with minor provincial differences in nutrient guidance and language, there was no variation in the guidelines pertaining to facilities overall. Due to the voluntary nature of the guidelines, facilities had the option to selectively adopt or adapt the innovation over time. Thus, constructs Innovation Source, Evidence Base, Relative Advantage, Adaptability, Trialability, and Innovation Design were not distinguishing.

6.3.2.1 *Innovation Complexity*

As both More and Less Successful facility CBI Leads identified guideline implementation as a complex undertaking, this was also not a distinguishing construct. Guidelines impacted multiple operational areas that often functioned independently (i.e., vending beverages, vending snacks, concession) and with differing contractual and partnership relationships. Facility CBI Leads also indicated that defining ‘healthier’ choices and operationalizing the guidelines for product offerings was challenging. However, CBI Leads noted the value of available tools to navigate some aspects of the complexity around identifying healthier food options and training support.

6.3.2.2 *Innovation Cost*

For Less Successful facilities, affordability of guideline compliance was an impediment to change making this a distinguishing construct. Indeed, the deep-seated perception emerged across all facilities that compliance with healthier guidelines was not financially viable.

“First hurdle of course is the fact that everybody needs to make money. And I knew that.

That’s not something that I didn’t know, but having said that, if healthy eating is

becoming the norm, or is becoming important in mindsets, then how come that isn't a money making proposition?" More Successful facility 2 CBI Lead [MS2 CBI Lead]

The More Successful facilities were better able to balance concern about potential revenue loss with positive aspects of change captured in themes emerging within the Mission Alignment construct and opportunities arising from the Recipient (facility patron) sub-construct of Assessing Needs, as described below.

6.3.3 II: Outer Setting Domain

The outer setting for municipally funded recreation and sport facilities encompasses the community where the facility is located, the municipality, and the province. Local Attitudes, Local Conditions, Policies and Laws, Financing, and External Pressure constructs were not distinguishing as no themes emerged. The Critical Incidents construct, defined as large-scale and/or unanticipated events, was not applicable to the current research.

6.3.3.1 Partnerships and Connections

Partnerships and Connections within the Outer Setting was a distinguishing construct. The More Successful facilities had pre-existing connections or developed stronger partnerships with their regional Public Health Unit. As part of their intervention implementation, they leveraged that connection and utilized support from Public Health Registered Dietitians (PH RD) as well as programming support offered.

6.3.4 III: Inner Setting

6.3.4.1 *Structural Characteristics*

Physical Infrastructure and Information Technology Infrastructure were not distinguishing constructs as no themes emerged and facilities were comparable (Table 6.1).

6.3.4.2 *Work Infrastructure*

The Work Infrastructure construct captures organization of tasks and responsibilities to support functional performance and was a distinguishing construct. One infrastructure characteristic impacting guideline implementation was whether there were those with the *Authority and Autonomy to Initiate and/or Enforce Change in the Food Environment*. An important characteristic of recreation and sport facility food service was that it was predominantly contract-based with multiple contracts in place across food service operational areas (concession, beverage vending, snack vending). The contractual nature of this aspect of facility food service structures impacted facility management's ability to initiate change. For example, in facilities with concession and vending contracts in place without clauses stipulating healthier options, food service providers were under no contractual obligation to make change and were often unwilling to do so.

"... so, for us, there are vending machines set up, which I have absolutely no control over because it's a corporate contract, so what goes into those I cannot influence." Less

Successful facility 2 CBI Lead [LS2 CBI Lead]

Conversely, in one of the More Successful facilities, a vending contract included a clause requiring healthier options, making change actionable with enforcement and monitoring.

“... when we went out to tender, we identified that healthy vending was a must for us, and they had to have a transition over. I think their challenge is more with the individual filling the machines that he doesn’t always have all things in his van when he comes to fill. So, he does an automatic refill with the Do Not Sell items. So, I believe we had the conversation with the manager or owner of the company and they’re amicable to make an amend to that process.” More Successful facility 1 CBI Lead [MS1 CBI Lead]

Also identified, was the related theme of the *Responsibility for Oversight* of the food environment, including enforcement of nutrition-based provisions. The More Successful facilities actioned this additional responsibility by building the monitoring into their CBI action plans once the necessity for such action was understood upon receiving baseline EPL audit reports.

“I’ve had to approach the vendor a few times and say that regular chips are not permitted in our machines, and they’ve been pretty good about getting them out of there.” MS2 CBI Lead

However, for the Less Successful facilities, oversight was seen as outside of defined responsibilities or as a temporary additional responsibility related to EPL intervention participation.

“And then kind of looking long term, one of the challenges is going to be who is look after – going to look after ensuring the consistency? So, you know where does that role lie in making sure, you know, those healthy things continue and things don’t sneak back

to the counter. So that's been one of the challenges, so far, it's sat on me." Less

Successful facility 1 CBI Lead [LS1 CBI Lead]

Another work infrastructure theme to emerge was *Adapting to Changes to Employment Tasks and Staff Responsibilities* resulting from increasing food healthfulness. This theme also captures the 'quick serve' aspect of the food service venues. Facility CBI Leads indicated getting feedback from service providers that healthier items required more time to make, and a different skill set from more traditional food offerings.

"Yeah, 'cause it's frustrating, like, 'cause chicken wings, right, we do baked wings, but they just take a while, right? . . . And people don't want to wait, like that the other difficult thing, is a lot of the time some the healthier items take a bit longer to get out, and people are just not patient enough to wait for them." LS2 CBI Lead

6.3.4.3 Relational Connections

Relationships, networks, and teams, within and across levels and boundaries, played an important role in the success or failure of implementing change. Of the numerous relational connections within the recreation and sport facility environment, two emerged as strongly distinguishing between More and Less Successful facilities: facility CBI Leads' relationships with food service providers and partnerships with local public health registered dietitians [PH RD]. A third relationship developed between the Provincial Coordinator [PC], the facility CBI Lead and the EPL community and this was identified as valuable for all four facilities.

Relationships with food service providers varied dramatically across and within facilities. In some circumstances, the food service providers were both open to participating in the intervention as well as supportive of transitioning to a healthier food environment.

“Very involved in this whole program, the Eat, Play, Live program, and we meet regularly, and we’ve offered her [Concession operator] support . . . in the concession to provide these healthy alternatives, and encourage them in ways, like, you know, hey get a menu out . . . to say you know, if you want to cater a lunch, or program running, um, you know, here’s some healthy things we can offer . . . she’s definitely jumped on board.”

MS2 CBI Lead

In other cases, food service providers had no interest in change and even communication was a challenge.

Partnership with the regional PH RD was a critical relationship for the More Successful facilities and a high quality relationship was described. A PH RD was a member of the intervention team for one of the More Successful facilities and for both More Successful facility CBI Leads, the PH RD was accessed as a support resource. This was a support that, while available, was not utilized in a meaningful way by the Less Successful facilities.

Relationships with other EPL facilities who were also adapting to provincial guidelines were beneficial:

“. . . the group chats [teleconference] we’ve had, um, we’ve had [Another facility name] ordered some of their marketing and advertising that they did on there, just their boards . . . That was useful, so we weren’t necessarily reinventing the wheel. [Another facility

name] did a survey, so we've got—and theirs is more just vending related, and then um, so we've used that as a base to build our new—we're trying to do more of a complete food services survey. . . So, I think those, for us, those connections with other departments [participating facilities] has been a useful part for sure.” LS1 CBI Lead

6.3.4.4 Communications

The quality and level of formal and informal communications was distinguishing between More and Less Successful facilities. Both groups cited the value of EPL teleconference meetings as an information sharing support community, for the opportunity to interact with other facility CBI Leads, and as a safe place to ask questions.

“Participating in this program, we had the ability to network with a lot of our peers around, so kind of learning and having that support network and availability of resources that was really a factor that helped us move forward, is the ability to ask questions of like-minded people and to gather resources.” MS1 CBI Lead

However, communication engagement with EPL Provincial Coordinators outside of these meetings was notably different between groups. For the More Successful facilities, check-ins with and accessing Provincial Coordinator support was utilized as a support system, with more frequent communication at a more engaged level.

“ . . . you suddenly have all these resources and the support and checking in regularly, and PROVINCIAL COORDINATOR's NAME been fantastic, I email her and say, 'hey how about [inaudible segment], are there any guidelines?'" MS2 CBI Lead

Whereas, for the Less Successful facilities, less communication was initiated by facility CBI Leads, and it took greater effort for the EPL Provincial Coordinators to obtain a response when contacted (i.e., for monthly check-in), and frequently response was limited to emails.

6.3.4.5 Culture

Culture was not a distinguishing construct between the More and Less Successful facilities. Yet, two themes emerging from this construct, *Recognizing Arena Food Norms* and *Patron Autonomy of Food Choice*, influenced other constructs/sub-constructs, like Tension for Change and Innovation Deliverers and Recipients, that were distinguishing. Within *Recognizing Arena Food Norms* all facility CBI Leads expressed the perceived expectation to offer foods traditionally found in these venues, such as fried food, hot dogs, chocolate bars, pop, and slushies.

“They’re coming in and they want their poutine and burgers or whatever, right. . .” MS2

CBI Lead

Patron Autonomy of Food Choice was value-based and encompassed the belief that changes to the food environment to support healthier options interfered with patron autonomy. More specifically, the removal of less healthy options was taking away patron choice.

“We did hear from some of our patrons that, you know, well, I should be able to choose

whether I want a regular pop or not.” MS2 CBI Lead

The influence exerted on other constructs resulting from these two themes make them important overall even though this construct alone was not distinguishing.

6.3.4.6 *Tension for Change*

The tension for change strongly distinguished More and Less Successful facilities. Across all facilities, CBI Leads shared encountering notable *Resistance to Change*.

“People are kind of stuck in their ways at this facility.” LS2 CBI Lead

However, in the facilities that were More Successful, there was greater buy in for the shift to healthier food options, greater responsiveness to the EPL initiative and associated supports, and a pre-existing push for change. The facility CBI healthy choices team within one facility endorsed the need for change to occur and had begun efforts prior to participating in EPL.

“We had started doing healthier vending, so we were kind of one step in the right direction, but very loosely.” MS2 CBI Lead

Tension for transitioning to healthier options was more strongly identified by More versus Less successful facility CBI leads. The push for change was endorsed by patrons. For example, in one More Successful facility a survey of patrons supported change and in the other More Successful Facility, it was feedback from parents that supported change.

“Parents that are here three nights a week with their kids for hockey, then all weekend for a tournament, are frustrated because they can’t find healthy options.” MS2 CBI Lead

Direction from a higher level within the municipal hierarchy was also identified as a factor increasing tension for change for the More Successful facilities and for one facility this provided strong support for efforts already underway.

“...and it’s kind of funny because we were already working on a survey that we had done about healthy options in the rec center and whatnot, and then I was doing my position [facility director] as well, so I came in with a little more enthusiasm, so we started working towards that. Then our new community services manager came in, NAME, and he said—he came to me right away, the first two weeks—and said ‘I want healthier options in the building, I don’t, you know, I don’t want to just be offering fries and burgers and stuff, I think it’s the rec center so we should have—’ you know, so he pushed it, and I kind of laughed and said ‘well we’re working on that’, so then we brought the concession staff into the conversation and we all kind of sat down and debated and discussed it, and you know, then this project came up.” MS2 CBI Lead

6.3.4.7 Compatibility

Compatibility was identified as an issue across all facilities as well as a distinguishing construct.

Two themes emerged around provincial guideline compatibility with facility food service workflow and systems. The first theme related to whether the guidelines were compatible with existing food service structural components such as contracts, level of operational control, and food providers willingness and/or ability to alter their current systems to align with provincial guidelines. The second theme addressed food preparation and the divergence from traditional arena food preparation and processes.

Without the inclusion of specific contract requirements for healthfulness of offerings, whether or not offerings could/would be made compatible with provincial guidelines was uncertain. A typical facility scenario included multiple contracts with differing levels of operational control affecting different operational areas (beverage vending, snack vending, concession). Further,

both food service providers and contract requirements could vary across these operational areas. For example, in one of the More Successful facilities, beverage vending contracts required healthier beverages only whereas the concession contract had no such requirement resulting in inconsistent beverage guideline compliance within the facility. This allowed the facility to enforce healthier products in vending but not in the concession.

Changing current processes, even with supportive contracts in place, was cited as a challenge. As described under the Work Infrastructure construct, some food service providers perceived that healthier options were disruptive to existing workflow systems. Changes were seen as incompatible with current systems and processes because food preparation was more time consuming and required a different skill set than traditional offerings.

6.3.4.8 Relative Priority

The More and Less Successful facilities exhibited notable differences in Relative Priority making this a distinguishing construct. For the More Successful facilities, prioritizing improvements in the healthfulness of the food environment was not seen as an ‘extra’ and separate from day-to-day operations and prompted their participation in EPL from the start. It was also perceived as a priority for patrons. With Less Successful facilities, food services appeared to be considered an auxiliary amenity. Competing financial concerns and perceptions of patron preferences for less healthy offerings emerged as a higher priorities.

“When you are dealing with a FRANCHISE NAME and you’re dealing with multiple business in here, if everyone is not on board with it, it makes it kind of difficult . . .” LS2

CBI Lead

The CBI Lead for one of the Less Successful facilities indicated implementation of guidelines in general was not a priority for their new management. Competing priorities also emerged amongst both Less Successful facilities for those in the role of CBI Lead:

“Effort on [EPL related] tasks/goals seemed to ebb and flow depending on competing priorities and also seasons.” Provincial Coordinator 2 [PC2]

It was also perceived that this was not a high staff priority for these facilities.

“I didn’t have a lot of buy in from the other staff here, and not due to any other factor than they are busy, and they have jobs, and this isn’t what they signed up for right, so ya.” LS2 CBI Lead

Finally, prior initiatives affected relative priorities in both directions. Experience with successful initiatives supported higher priority for guideline implementation. The reverse was also true. For facilities that had offered healthier menu choices that were not well received, the relative priority of actioning change was decreased.

“... and we’ve tried in past years to do different things and it just – revenue drops and it’s an area that isn’t revenue producing. Its cost is subsidized through taxes, with the rest of our services and so just trying to keep an eye on that with it, so keeping that on the forefront as we make changes.” LS1 CBI Lead

6.3.4.9 Mission Alignment

All facilities participated voluntarily in the CBI, indicating a tacit agreement that a food environment that aligned with provincial guidelines fit with the facility’s overall purpose and goals. Nevertheless, there were some distinguishing features between More and Less

Successful facilities. During interviews, only CBI Leads from the More Successful facilities described their perception of that alignment and the value of making changes.

“And then even just with the media in general; I mean you hear so much nowadays about how many kids are obese, and people that are obese and everything else. I think it just kinda makes sense to when you argue that you know it’s a rec centre and the kids are here for physical activity, and shouldn’t we be providing them with healthy options to promote that kinda thing?” MS2 CBI Lead

However, that same More Successful facility CBI Lead also described the facility as being an entertainment venue and indicated that the requirement to provide a healthier food environment was perceived as a conflict for this activity.

“We’re not just a rec centre that has kids coming in for sports, and we say, ‘Yeah but the kids, they’re coming in for physical activity, so we want, you know, why not have healthy options?’ . . . we also are an event centre . . . It’s entertainment, they’re not here for physical activity they’re here for entertainment. . . you know the idea of going 100%, you know, we’re gonna go with a sandwich bar and wraps, the community’s not really receptive to that because they sometimes come for entertainment.” MS2 CBI Lead

They went on to describe looking for compromising approaches to address this conflict.

All facilities described some buy-in challenges with this overarching commitment to support a healthier food environment, but challenges seemed greater and emerged more frequently in the Less Successful facilities. The More Successful facilities were able to increase buy-in more than the Less Successful facilities.

“Yes buy-in across the board, even at the political level, you know it took a couple of meetings to get the healthy eating policies passed, through even our Parks and Rec, you know committee, . . . So, and similar situations like that, so it just took some convincing and some education.” MS1 CBI Lead

For the Less Successful facilities, *Financial Responsibility* emerged as a theme with CBI Leads describing a facility mission that aligned with being financially viable and even profitable. This was perceived to conflict with the overarching ideal that recreation and sport facilities have a mandate to support aspects of healthier lifestyles beyond physical activity. Since the perception (described in the Innovation Cost construct) was that healthier options and associated preparation processes (i.e., more time consuming) would result in revenue losses, adhering to the nutrition guidelines was considered both irresponsible and incompatible with the food service business model.

“For us it’s a business, looking at it as a business to make money, we really aren’t interested in taking out those deep fryers, because chicken wings are chicken wings and that’s what we make our money on right. So, it’s kind of frustrating right.” LS2 CBI Lead

6.3.4.10 Available Resources

Available Resources was not a distinguishing construct overall, nor were the sub-constructs Physical Space, Materials and Equipment, or Funding. All four facilities had full service concessions with equipment necessary to provide healthier offerings. To support implementation initiatives, as part of the EPL CBI each facility was provided \$1000. Use of funding varied based upon individual facility plans and objectives.

Two facilities (1 MS and 1 LS) utilized a portion of the funding provided to purchase new menu boards to make understanding the healthier options easier for facility patrons.

“...and then new menu boards, we updated the menus at the concessions, and all the healthier items are highlighted in - sorry, they’re written in - green . . .” MS2 CBI Lead

As well, CBI Leads identified using part of the EPL resources on marketing materials to promote healthier choices.

“The signage, we’ve used the stickers they have for healthy options to put on vending machines and entrances, so people know there is healthy options.” MS1 CBI Lead

6.3.4.11 Access to Knowledge & Information

EPL support and training resources for implementation of the guidelines included an initial training, ongoing teleconference meetings, Provincial Coordinator monthly check-ins and on-demand access to Provincial Coordinators. There was also a suite of online information resources, including websites providing guidance for each province’s nutrition guidelines [2, 67]. Other online resources provided or identified as part of the CBI included toolkits and resources available on the Stay Active, Eat Healthy website [71], and the BC Brand Name Food List [159]. While all facilities had these resources available to them, use of this this information varied making this a distinguishing construct. For example, one of the More Successful facility CBI Leads described using information support to integrate healthier food and beverage guidelines into their service provider contracts or Request for Proposal [RFP] calls:

"I used the resources definitely when I was creating like the lease agreement in terms of using the reference to the healthy guidelines for food choices and those kinds of things. So, that helped there." MS2 CBI Lead

In contrast, one of the Less Successful facilities identified this as a gap, not realizing that such information was available within the suite of resources.

"And then also if there are examples, like say like – I'm thinking like a vending RFP or something that's got that language that we can insert into our, say like legal language we can insert into our RFPs to get that kind of information that we're looking for." LS1 CBI Lead

Further, both More Successful facility CBI Leads described specific uses made of available resources, whereas the Less Successful facility CBI Leads, when asked in the interviews, had difficulty describing how or what resources were utilized as part of EPL participation.

"We'll look up [food/beverage] items, was something that we used quite a bit. As well as through the network being able to get copies of different types of policies and procedures, and you know statements, and knowing where to look to gather information, was incredibly helpful. As well as you know some of the research that was provided to be able to explain why, and what our goals are, you know so kind of a lot of the resources that we could use to learn from what other people were doing, and to have information to be able to have conversations to gain some more buy-in from people." MS1 CBI Lead

6.3.5 IV: Individuals Domain: Roles Subdomain

6.3.5.1 High-level & Mid-level Leaders

Facility and/or municipal management were often responsible for determining whether a facility would implement the provincial guidelines. Leadership from those in key decision making roles was distinguishing between the More and Less Successful facilities. For the More Successful facilities strong high or mid-level leadership was identified at facility level, municipal level, or both.

“Management that’s on board makes a difference too.” MS2 CBI Lead

Whereas, for the Less Successful facilities, such leadership was inconsistent or non-existent.

“...and now we have a new person in there. [pause] And he kind of... he doesn’t understand the scope of this, and you know, they were all too busy with dealing with that change over that there’s really been no interest in this [EPL intervention] . . .” LS2 CBI Lead

6.3.5.2 Implementation Facilitators

Individuals in position to coach and support the CBI included the EPL Provincial Coordinators and Public Health RDs. The individuals filling the Provincial Coordinator role within each province remained consistent across the intervention period. While access was not distinguishing, interaction with these implementation leads (described below), and implementation action varied. For the More Successful facilities both EPL Provincial Coordinator and PH RD were clearly identified as instrumental in supporting change.

“I feel like we are getting a lot of support between PROVINCIAL COORDINATOR with this project, and then, again, we have PH RD locally.” MS2 CBI Lead

However, while the EPL Provincial Coordinators and PH RDs were identified as valuable for the Less Successful facilities, specific details regarding how or why that was the case were notably absent. Further, the PH RD role was filled by different individuals based upon region, and for one of the Less Successful facilities the PH RD contact changed several times during the CBI period reducing coaching and support opportunities for that facility.

6.3.5.3 Implementation Leads

Facility CBI Leads coordinated the CBI at the facility level with the support of Provincial Coordinators, PH RDs, and a facility health team if one was active. This was a construct with strong differences between the More and Less Successful facilities. Within the broader theme *CBI Lead a Defining Role for Actioning Change*, three distinguishing sub-themes emerged: *Level of Engagement Varied*, *Ability to Action & Influence Change*, and *a Person Filling the Lead Role Consistent* over the course of the intervention period. For the More Successful facilities, Implementation Leads were consistent through the intervention period, were fully engaged, and they had either the authority or fortitude to drive change through appropriate level(s) of authority. However, for the Less Successful facilities, the facility CBI Leads changed, were not committed or engaged, and felt that they were ‘stuck’ and not in a position to initiate action. For example, for one of the Less Successful facilities, the PC commented:

“Their effort seemed to be limited due to their belief of their [limited] ability to make change – the director [facility director and EPL CBI Lead] ‘doesn’t know what to do’ . . .

without broader support from the city and sports leagues.” Provincial Coordinator 2

[PC2]

6.3.5.4 Implementation Team Members

The More Successful facilities had more fully developed teams who collaborated with CBI Leads to drive implementation making this a distinguishing construct. Formation of a health team was proposed as part of the initial steps for the CBI. The More Successful facilities had facility CBI healthy choices teams that appeared engaged, while Less Successful facilities, even if they had created such teams, did not emerge as a CBI implementation facilitator.

Participation of food service providers as CBI team members was also an aspect of team development described in the More Successful facilities.

6.3.5.5 Innovation Deliverers

As individuals directly providing the food offerings and therefore responsible for food and beverage alignment with provincial nutrition guidelines, the Innovation Deliverers construct encompasses food service providers. Due to variation across operational areas and facilities, this was a mixed construct. Some providers were supportive of efforts to better align with provincial guidelines, while others, only supported healthier options because of contract stipulations. Some food service providers reportedly had no interest in making change and used standing contracts to hold that position. When summarizing challenges faced by one of the Less Successful facilities, the Provincial Coordinator tallied the level of food service provider support for change efforts in one Less Successful facility as follows:

“One of three food service operators involved [willing to participate in EPL CBI]; zero vending operators.” Implementation Summary LS2

6.3.5.6 Innovation Recipients

Guideline implementation recipients are those interacting with the facility food environment and who could potentially benefit from the provision of healthier options. While this is primarily facility patrons it also encompasses facility staff and can overlap with those in other roles, such as the facility CBI Lead. This was not a distinguishing construct as a broad range of recipients and preferences were identified across all facilities.

6.3.6 IV: Individuals Domain: Characteristics Subdomain

6.3.6.1 *Need*

Individuals' Needs was not a distinguishing construct as the value of providing a healthier food environment for facility patrons, particularly children, was recognized across all facilities as affirmed by their voluntary enrollment in EPL.

6.3.6.2 *Capability*

There were notable differences between the More and Less Successful facility CBI Leads in their application of knowledge and skills towards food environment change making this a distinguishing construct. CBI Leads in both of the More Successful facilities demonstrated resourcefulness in accessing and utilizing EPL supports and a capability to take action on their implementation goals that was not evident in the leads from Less Successful facilities.

"I'm just monitoring the vending just to make sure they are starting the switch over. We did a vending audit in September to see where they're at and where they're going, and we'll just keep on top of that for the next little while." MS1 CBI Lead

6.3.6.3 *Opportunity*

Opportunity was also a construct strongly distinguishing More and Less Successful facilities.

Autonomy and Authority Required to Initiate Change, and Time Availability a Requisite for

Action emerged as discriminating themes. Less Successful facilities lacked the leadership support (as described) or initiative to act on available opportunities. Limited staff and time also factored into opportunity for the Less Successful facilities. The facility CBI Lead described challenges with workload:

“... it’s sort of an added, it’s a very warranted aspect, but it’s an added thing to our already busy work schedules.” LS1 CBI Lead

Contracts, as discussed in the Work Infrastructure sub-construct above, also emerged as pivotal to the power and scope of facility CBI Leads to implement change. All facilities had contracts with vendors in some operational areas. For some this was limiting:

“We weren’t able to do much with the vending side cause we’re in the middle of a vending contract . . .” LS1 CBI Lead

One of the Less Successful facilities also had a non-compete clause with a franchise operating within the facility, which limited products they could offer at the facility concession. Although the concession food service vendor had the desire to support change, the franchise agreement restricted options sold by competitive food vendors, limiting the opportunity to change product lines offered by other venues within the facility.

“And the other hard part too is because we have the FRANCHISE NAME in there, we can’t be in competition with them. . . . So, as far as putting like, quick serve salads out of the concession and wraps, we can’t do that.” LS2 CBI Lead

However, in other circumstances nutrition parameters included in contracts provided the opportunity to action change.

6.3.6.4 Motivation

Motivation varied across individual roles across facilities, yet this was a distinguishing construct. In the More Successful facilities, CBI Leads were highly motivated and committed to change. For example, in one of the More Successful facilities the CBI Lead did not have the power to

implement facility policy without multiple levels of approval, but they took steps towards creating a healthier facility food environment. The Provincial Coordinator for this facility commented:

“This organization was determined to create a policy and align their food environment with it. They were not deterred when they couldn’t make changes immediately to the concession but are determined to keep working towards these goals.” PC1

Supportive leadership for both of the More Successful facilities further increased the already strong motivation of the facility CBI Lead.

“I’m gonna call it pressure from higher up... and it’s about time we got this going.” MS1

CBI Lead

One Implementation Lead for a Less Successful facility indicated they were only fulfilling the role as directed by someone of higher authority; they did not demonstrate personal commitment or enthusiasm. The other Less Successful CBI Lead described their management team as being *“interested in making those changes”* (LS1 CBI Lead), yet workload issues impacted participation.

Motivation of food service providers also varied across facilities, as described previously.

“The concession operators, the owner of that has been around forever. So, getting him on board with this whole healthy eating stuff, he doesn’t necessarily agree with. So that’s been a little bit challenging, although he has been quite good about working with us.” MS2 CBI Lead

6.3.7 V. Implementation Process Domain

This domain relates to the activities and strategies used within the CBI to support implementation of the provincial guidelines.

6.3.7.1 Teaming

Teaming, defined as the coordinating and collaborating on implementation tasks, was distinguishing and related strongly to Relational Connections and constructs within the Individuals Domain (IV). The More Successful facility CBI Leads emphasized the collaboration aspect of the intervention, highlighting the importance of those relationships:

“And how can we help you, was the other thing, like what can we do for you guys to help? That’s one of the approaches we had to concession, what can we do to help you guys [inaudible segment]. And then I think having RD NAME, she’s from PROVINCE MINISTRY . . . she’s been working with us for years, she’s on our Eat Play Live committee, . . . It’s her, myself, and FOOD SERVICE PROVIDER NAME from the concession, and she’s been very helpful to FOOD SERVICE PROVIDER NAME, like [inaudible segment] a lot to say, can you work with FOOD SERVICE PROVIDER NAME to come up with um, you know, how do you make a cheeseburger healthy, right? Or, healthier at least, right, so it’s, you know, we’re adding vegetables for free and charging extra for cheese, and our burgers are a very lean, high quality meat, and they went to brown buns. So, yes, we still have cheeseburgers on the menu, but the chicken burger - grilled chicken burger on whole wheat - is cheaper. Like, so we just kind of tried to work- so she’s helped with that process, giving the support to the concession that helps it be successful.” MS2 CBI Lead

Across all facilities, the facility CBI Leads described collaborating with EPL Provincial Coordinators to some degree.

“Yeah, oh yeah, absolutely. Yeah, no she’s [PC] definitely... she’s provided us with lots of ideas and stuff like that ...” LS2 CBI Lead

Effort to work with food service providers was described and the PH RD collaboration with concession operators highlighted for both More Successful facilities. For example, changing menu items was identified by the More Successful facilities as an action goal, and CBI Leads utilized skills and knowledge available along with PH RD support to guide the desired changes as well as help develop the skills and knowledge of food service providers. However, for the Less Successful facilities, the personnel changes described in the Individuals Roles sub-construct made efforts at team-building a challenge.

“There was staff turnover of the [facility] director and the public health RD. Often it seemed like the food service operator and director were at a loss of what they should do.” PC LS2

Some collaboration efforts were more successful than others. One More Successful facility had a concession that was run by a sports league as a fundraiser. While the league was not open to changing food offerings, they decided to pass concession operation to a food service provider that was open to collaborating with the facility to offer healthier options.

Developing relationships with those outside of the facility was also described as an important part of the teaming for this intervention. Those relationships included other facilities

participating in the EPL CBI, organizational partners, and external product suppliers. For example:

“... this week or the week after, we’re going into SUPPLIER, and we’ve got their corporate chefs kind of going to push some ideas to help us with some of this.” LS2 CBI Lead

6.3.7.2 Assessing Needs

6.3.7.2.1 1: Assessing Needs: Innovation Deliverers

The needs of food service providers as the front line deliverers were assessed throughout the intervention period as part of efforts to action change. This was most evident in More Successful facilities.

“We’ve been trying to do right from the beginning is trying to figure out what it is that the hurdles are that people [food service providers] are running across. . .” MS2 CBI Lead

With the needs assessment process, *Navigating Food Service Providers’ Fear of Revenue Loss* emerged as a theme relevant for all facilities. This theme centred on food service providers’ perceived need to be competitive and their ‘bottom line’. The assessment identified how fear of revenue loss presented a barrier to change among some food service providers.

“The main operator is an older gentleman who’s been in the food industry forever, and he’s not sold on the healthy stuff. He says he’s tried selling chili and soup and you know . . . and shows us . . . that he doesn’t make money when he tries to offer healthy stuff.”

MS2 CBI Lead

Concession and vending providers also expressed the need to provide food that was competitive with food options both within (e.g., franchises located within the facility) and around the recreation and sport facility. Inequitable application of nutrition guidelines across operational areas within a facility was perceived to be unfair and to interfere with financial competitiveness.

“That the concession is allowed to sell regular pop and chips as well as have the healthier options there, so you know. . . But our [vending machine] vendors don’t like that because we don’t allow them to have any. So as soon as there’s regular chips in the [vending] machine, we’re on them and we say ‘Nope, this doesn’t follow the guidelines.’ So that’s been a bit of a challenge.” MS2 CBI Lead

As described previously, standing contracts without nutrition clauses left no avenues to address this inequitable application of guidelines within the CBI time window, though strategies to renegotiate contracts were among EPL resources provided.

Assessment also identified that revenue related fears included reduced profit margins of healthy options and food waste from having to discard stale-dated products and product spoilage.

“Yeah, like we’ve thrown out a ton of fruit and stuff like that during the last couple months and it’s just like, we haven’t been able to get people to order and we don’t really understand why.” LS2 CBI Lead

Separate from food service providers, expressed needs of CBI Leads as actors in implementing provincial guidelines included support from higher level stakeholders and decision makers;

guidance on food offerings to address guideline complexity; resources and success stories to support change; and firmer regulation.

One Less Successful CBI Lead described their challenge with facility decision makers:

“So corporate level and what is in place is my [CBI Lead] biggest challenge here. It however I believe is also the conduit for proper success, to have a champion high up within an organization, who recognizes the importance, especially within a municipality so budget dollars can be spent there, because even if I would be partial to championing Eat Play Live at my facility, as soon as my supervisors or bosses are looking at budget dollars, if there is not a positive they don’t really care about Eat Play Live anymore. Right so it has to be something that is mandated from the municipality perspective in order to have success from the facilities.” LS2 CBI Lead

Facility CBI leads described how resources and success stories could provide supportive guidance:

“I think just having, like they have with the website and so on, just resources to go to just things, and like resources of success stories is always useful. So, if you find another center that’s got a similar kind of set up, and seeing what they’ve done that’s worked so you can just, when you’re trying to come up with ways to tackle different changes.” LS1 CBI Lead

Facility CBI Leads also expressed a desire for firmer regulation:

“Ya right, I think there needs to be if province or municipality or what ever it is, says ‘thou shalt’ then that will happen, until then it’s really up to anybody’s individual whim at any given time.” LS2 CBI Lead

6.3.7.2.2 2: Assessing Needs: Innovation Recipients

As recipients of the innovation, facility food service patrons’ needs are at the forefront. Three themes emerged within this sub-construct. First was *Direct Patron Assessment*, second was the *Perception of Patron Expectations Guiding Offerings*, and third was *Attention to User Groups*. While there were aspects of these themes common to all facilities, distinguishing differences did emerge between the More and Less Successful facilities.

Distinguishing differences were highlighted within the theme *Direct Patron Assessment* by surveys conducted by two of the facilities (1 MS, 1LS) to assess patron priorities and preferences. The More Successful facility learned that patrons were quite receptive to improving the healthfulness of the food environment.

“We did a survey and that really helped because the response from the public was a lot of people wanted more healthy options. Like the amount of people that came out and said ‘Well I would eat there more if you had something healthier than poutine’ kinda thing, right? So, I think that that was really helpful.” MS2 CBI Lead

However, the Less Successful facility CBI Lead described survey feedback as indicating that no vending changes were wanted and to limit concession food change to some suggested additional options. No further detail was provided with the exception of indicating this survey was conducted in the neighbouring community and purposefully not limited to facility patrons.

The second theme, theme of *Perception of Patron Expectations Guiding Offerings* was not based on formal assessment but on perceptions of patron needs. Existing norms were recognized as a factor guiding patron expectations of a traditional unhealthy recreation food environment across all facilities. However, the Less Successful facilities focussed on these perceived norms as a barrier to change. The More Successful facility CBI Leads identified feedback from patron groups (e.g., parents, leagues) supporting healthier food options while attending activities at the recreation and sport facilities.

“I think is just what I’m hearing, like I hear comments from the public, you know for instance, a mother came up to me and said she loves that she can give her child money for the vending machine and knows that there’s nothing really unhealthy in the machine. You know I mean it’s not fruits and veggies by any means but at least it’s the baked chips or nuts or rice crackers or whatever. So, I’ve heard comments from the public that they appreciate that when they go to their kid’s hockey game, that they can grab a wrap after the game for the child rather than being sucked in to getting them a burger and fries or going somewhere else to have something to eat.” MS2 CBI Lead

Also, within the theme of *Perception of Patron Expectations Guiding Offerings*, the sub-theme, *Food Choice Autonomy* around food decisions emerged across all facilities.

“... it’s difficult for us as the facility operators to dictate to our user groups.” MS1 CBI Lead

Facility CBI Leads perceived that patrons wanted choices and *demanding* availability of less healthy options. Yet, one facility CBI Lead, when asked about observed changes, also described

a shift in patron choices, not aligning with the assessment of patron expectations as described above.

“We are seeing more people order more of the healthy choices, so there is definitely just a culture change that is helping it as well. People are a lot more health conscious these days, our whole wheat buns, we are selling a lot more of those now-a-days and all that kind of stuff.” LS2 CBI Lead

Attention to User Groups Differences emerged as the third theme. There was a perception identified by facility CBI Leads and food service providers of contrasting preferences for the healthfulness of food offerings for the different patron groups, for example, amenities targeting child versus adult groups. This included a recognition that supporting healthier options for the many children who use recreation and sport facilities was appropriate.

One facility CBI Lead went on to describe how this dichotomy was addressed:

“They’re [concession operator] trying to limit some of their unhealthy items during hockey practices and hockey tournaments, but keeping it more open during a JUNIOR A TEAM NAME game where we’re recognizing that people are coming in for entertainment, not for sports for their family. So, there’s a difference between the two.”

MS2 CBI Lead

6.3.7.3 Assessing Context

Context within CFIR is defined as facilitators and barriers to implementation of both the innovation (provincial guidelines) and intervention (CBI). This is not to be confused with the EPL CBI settings-based context factors that were identified as part of the initial facility assessment

(e.g., amenities, food services, community size). Assessing Context was a distinguishing construct and emerging themes included *Food Culture*, *Nutrition Policy* within food service contracts or at facility level, *Fear of Revenue Loss*, *Consequences of Prior Experience/Exposure to Improving Facility Food Environment*, and *Control of Product Offerings*.

The theme *Food Culture* in recreation and sport facilities emerged as an important context factor. The seemingly entrenched cultural norms favouring unhealthy foods in recreation settings were identified as a barrier for all facilities. Buy-in to the value and necessity of nutrition guidelines also emerged as a critical aspect of this context factor.

“We have . . . a couple of key challenges. So, honestly one was changing the minds of some staff and the public, that this was a right direction to go. As well as, we’ve had some limited buy-in from our concession operator, our food operator, at the AMMENITY CONCESSION, you know he’s willing – he’s been willing to make some changes but not all until his lease comes up, and we’ll negotiate at that point in time, so.” MS1 CBI Lead

The two More Successful facilities had stronger buy-in from facility management as well as partners. Management for one Less Successful facility was described as not supportive of efforts to make change. While management within the other Less Successful facility was described as having buy-in, this did not translate to action in facilitating targeted change.

“I think some of it was staff buy-in. I think some of the big ones is just going through the process and getting some staff buy-in for the current food supervisor at that time looking at it, I mean it’s going to take a bit more work beyond what was required originally to get some of those changes and get behind them. And I think that was something that we

ran into a little bit. There's certainly support from the management side and also from the council side . . ." LS2 CBI Lead

Healthy *Nutrition Policy* either defined in food service contracts or as a facility level policy emerged as the most significant factor regarding control of product offerings and therefore, a critical context consideration. Food services managed at facility level facilitated positive change as there was internal authority to action contract change in support of healthy guidelines.

However, food service contracts negotiated beyond facility level imposed a challenge.

Within the *Nutrition Policy* theme, facility level policy emerged as a contextual strength. None of the facilities had facility-level nutrition policy in place at the beginning of the CBI and only one of the More Successful facilities had a full policy in place by the end of the intervention period. Within other facilities, there was an expressed recognition that facility-level policy would ease the transition to a healthier food environment. One of the More Successful facilities identified facility policy as a critical facilitator to increasing healthfulness. The facility CBI Lead from this facility identified that there may be barriers to obtaining necessary approvals for the targeted policy implementation and accounted for these potential barriers when actioning these approvals. At the halfway point of the intervention the CBI Lead commented:

"I anticipate when we get to the municipal council with this policy we're gonna face some challenges at that level and more because of personal beliefs of individuals versus the corporate belief of what's best for our community." MS1 CBI Lead

Then, at the end of the intervention period, after instituting the policy they commented:

“The main factor was having a policy in place so that when we did get the new vending operator, we had the policy that we could work with. And then now with the new concession operator we’ll be able to follow that policy as well.” MS1 CBI Lead

Finally, as discussed previously, fears around potential revenue loss, previous experience with changing the food environment and locus of operational control all came out as contextual influences.

6.3.7.4 Planning

The EPL CBI incorporated structured planning and goal-setting steps into the intervention, with an initial implementation plan, associated tasks and task assignments and plan updates throughout the intervention period. Yet, planning was a strongly distinguishing construct. Facilities were guided on the use of SMART goals, however, the More Successful facilities utilized more detailed goals that incorporated known context factors. For example, the More Successful facility that targeted implementation of the internal facility-level policy described above recognized that any policy had to receive municipal approval, and the goals and steps necessary to action that approval were included in the overall planning process. The facilities experiencing less success set more ambiguous goals and tasks were not as clearly linked and defined as for the More Successful facilities. For example, the Less Successful facilities outlined goals using terminology such as ‘review’ and ‘explore’, in contrast to action-oriented, clearly defined goals outlined by the More Successful facilities. While some of the planned goals did identify outcomes, identifying metrics associated with monitoring goal attainment was absent for many of the goals.

Planning and goal-setting were also directly linked to the level of involvement of the facility CBI Lead. In the More Successful facilities, the facility CBI Leads were highly involved and took responsibility for actioning the planned implementation activities, whereas, in spite of on-going efforts by Provincial Coordinators to provide support and guidance, Less Successful facility CBI Leads did not demonstrate the same level of involvement. For example, one of the Less Successful facilities only completed the first implementation plan, with no updates or modifications made through the intervention period.

6.3.7.5 Tailoring Strategies

Tailoring Strategies was a distinguishing construct for the facilities. While all CBI leads were able to plan according to perceived individual facility needs and goals, the approach to tailoring strategies to fit facility context, address food service provider (Innovation Deliverers) needs, and to leverage facilitators and address barriers varied. Within More Successful facilities, more attention was given to tailoring strategic approaches to context factors and anticipated challenges food service providers might face in making changes to food offerings.

“With the concession we’ve been working with the concession lease holder and requiring them to increase their, well working with them to help them come up with menu options that will be more receptive to the community. And we also signed a lease agreement with them on an annual basis, because they’re kinda old school, they’ve been around a long time. So, getting them on board has been a little bit more challenging. So, we’re at 30% healthier options, new menu board that brings attention to the healthier options. Little changes like adding lettuce, tomatoes to all burgers and not having cheese as

standard and having veggies as a side and standard rather than fries. Using brown bread instead of white, those kinds of things.” MS2 CBI Lead

The value of prescriptive guidance as a strategic approach was also identified.

“So now that we have that [facility-level policy], it is a lot easier to almost say enforce, I mean maybe that’s – maybe you know get people to comply rather than get buy-in, but at least it’s easy.” MS1 CBI Lead

In one of the More Successful facilities, a contract was already in place that provided for healthier vending options, so strategies focussed on on-going compliance from the provider, thereby leveraging a facilitator. In another example, to address the known barrier of a food service contractor unwilling to make change, one More Successful facility took advantage of the expiration of their current contract, replaced the food service provider, and included a health/nutrition clause in the contract with the new provider. With the Less Successful facilities, instead of finding modifiable factors to begin to address barriers, CBI Leads simply identified the contextual challenges and got ‘stuck’ when attempting to choose and tailor implementation strategies.

“This facility struggles to make changes as they felt limited with what they could influence. . . Often it seemed like the food service operator and director were at a loss of what they should do. They felt discouraged by some failures. . .” PC LS2

One other key factor identified for tailoring strategies, and directly related to the Teaming construct, was collaboration with PH RDs and EPL Provincial Coordinators on strategic

approaches. For example, PH RD expertise emerged as being integral to supporting menu changes.

“So, [PH RD] working with the concession to come up with some healthy options so that the team can order a healthy meal either for after the game or something to go and we’re providing that rather than again just the whole traditional burgers and fries and such.” MS2 CBI Lead

6.3.7.6 Engaging

Encouraging food service providers and facility patrons to adopt nutrition guidelines fell primarily on the facility CBI Leads and health team if one was present. The level of engagement of the facility CBI Leads was reflected in the activities undertaken and overall was a distinguishing construct. Both of the More Successful facilities were described as highly engaged by respective Provincial Coordinators, whereas for both the Less Successful facilities, engagement was described as low. As an example, the EPL teleconferences were a practical measure of engagement; More Successful facilities participated and collaborated fully, whereas the Less Successful facilities were absent more frequently.

6.3.7.6.1 Engaging: Innovation Deliverers

Engaging food service providers as innovation deliverers was a mixed construct as engagement varied across both operational area and facilities. Some operational areas had successful food service engagement in increasing healthier options. This included harnessing the expertise and experience of food service providers to facilitate implementation of changes that supported healthier options, use of signage, product presentation, and tailoring products to user groups.

“She’ll [Concession manager] make meals catered [to] the [sports] team, or bagged lunches catered to the team, to promote things like, water instead of pop, or juice kind of thing, [inaudible segment] they’re getting healthier bagged lunches, and I think the teams are appreciating that, because they would leave here and go to, say, Subway™, but now they can get, you know, sandwiches and water here rather than having to go elsewhere to get it, and it’s all ready for them.” MS2 CBI Lead

It also included monitoring feedback, ensuring agreed upon product offerings, and seeking meaningful problem-solving to address both modifiable and non-modifiable barriers.

“... even FOOD SERVICE PROVIDER when she’s got a question, she doesn’t hesitate to email PC NAME and say, you know, this is what we’ve done and get feedback from her. So being part of this project really moved things along.” MS2 CBI Lead

However, in other operational areas across facilities, service providers were not engaged; they were unwilling to implement change or stalled by unmodifiable barriers in some aspects of their operation.

6.3.7.6.2 Engaging: Innovation Recipients

The value of engaging with facility patrons to support making healthier choices emerged across all facilities.

“... the best I can do is provide information or facilitate information sessions, so we have tried to post as much pertinent information in common, busy, public areas that might give some general nutrition information, certainly not telling you what to do, it’s just giving you some tools to perhaps, make those decisions . . .” LS2 CBI Lead

However, the degree of support and engagement differed between More and Less Successful facilities. Engagement efforts included providing free healthy snacks with healthy messaging, tastings, identifying healthier options on menu boards, healthy options information on digital media displays, and the EPL promotional stickers.

“We had a little display set up by the entrance, when people came in about choosing water instead of juice, and different choices – that cereal one was a good one that people liked. And we also used all the stick-on stickers for the vending machines about healthy choices. We had those plastered up around the building.” MS1 CBI Lead

Less Successful facilities seemed limited to the passive marketing approaches.

“Ya, so there has been some signage that we put up, like on some of our pop coolers, trying to get people to stay away from some of the sugary product there. On our menu we noted everything as far as healthy choices go and tried to point out those lower caloric options. So those were kind of the main ways we tried to let people know.” LS2 CBI Lead

6.3.7.7 Doing

The Doing construct focuses on incremental implementation to cumulatively optimize use of the nutrition guidelines and it was a strongly distinguishing construct between the More and Less Successful facilities. All facilities took successful steps toward providing a healthier food environment; the biggest difference was the specificity of the planned actions, as described in the Planning construct (above). The More Successful facilities had clearly defined action steps to optimize implementation over time. Bigger steps were taken such as changing food service

providers, enforcing and monitoring of existing contracts, and, as highlighted above, for one More Successful facility, progression through steps necessary to implement a facility food policy.

“I would say our progress has been reasonably good, we’ve been able to get a policy together which governs a lot of this and taken through to our mayor and council. As well as the timing was up for our food and beverage vending, so we were able to incorporate a lot that into the request for proposal.” MS1 CBI Lead

Within the concessions, smaller steps were taken than with vending as part of a longer-term progression to a healthier environment. Concession changes included changes such as removing *Do Not Sell* products from sight lines, adding healthier options to menus, making existing menu offerings and default side dishes healthier, and promotion of healthier options with signage and product sampling.

“We reprinted all our menus, and we got the healthy choice, like, signal on there. So, we have like a little ‘thumbs up’ next to all the healthy food choice items on the menu to try to direct people in that direction.” LS2 CBI Lead

Approaches also included the initial steps toward cumulative change, such as embedding into contracts a phased-in approach to increasing the proportion of healthier offerings for concessions and vending over time.

“We’ve also changed out vending operator, and, in our contract, we have the switchover to healthy options over the next three years. So, we’re coming up on the end of year one. So, this big change will be starting next year.” MS1 CBI Lead

In some operational areas, little action was taken to change the food environment in the short term due to unmodifiable barriers described above. However, preparations to address some of the current barriers in future when they become modifiable were also made. Further, some facilities were able to implement internal policies regarding event menus and staff meetings, thus moving the facility food environment toward normalizing healthier options.

6.3.7.8 Reflecting & Evaluating

Both qualitative and quantitative data were collected as part of the CBI to support implementation of provincial nutrition guidelines in participating facilities. Formal measures of implementation outcomes and process included facility audits, implementation summaries, and interviews. Feedback was integrated throughout the intervention through teleconferences and EPL Provincial Coordinator support. To provide feedback and guidance to support on-going efforts, facilities were provided with a final report detailing facility specific intervention outcomes.

From a final interview with facility CBI Leads, the theme, *Moving Forward with Change*, emerged which identified six supports they believed were important to support ongoing change (Table 6.3). CBI Leads were also asked to identify any plans for continued implementation of the nutrition guidelines for the three to six months following the intervention period. Using reflection to inform ongoing goal setting and action planning was hoped to support sustainability beyond the research project. This was not distinguishing as all facilities identified planned actions to better align facility food and beverage offering to provincial nutrition guidelines.

Table 6.3 Case facility CBI lead recommendations to facilitate moving forward with change

Recommendation	Rationale/Explanation
Mandated nutrition policy at municipal or provincial level	Positions responsibility outside of recreation facility
Coordinated change across facility and municipal players	Ensures contract alignment across operational areas (e.g., vending, concession)
	Identifies and defines guideline and implementation roles, responsibilities, and accountability
	Utilizes committee versus individual leading change at facility level
On-going access to up-to-date online resources	Permits easy access resources to facilitate change (e.g., healthier food sourcing options, success stories) Supports guideline implementation and compliance sustainability
Guideline marketing resources targeting facility patrons	Shares benefits of and recommendations for healthier options
Provincially maintained stakeholder contact list for on-going communication	Allows continuing communication with guideline stakeholders: Facility, municipal, and provincial players (e.g., facility representatives, municipal and provincial implementation/guideline leads)
	Fosters development of a community of practice
Presence at professional conferences/meeting	Provide a voice for municipally funded recreation food facilities as industry stakeholders (e.g. parks & recreation conferences)

6.4 DISCUSSION

This multiple case study investigated factors influencing the success of an 18-month capacity-building intervention (CBI) aimed at supporting implementation of voluntary nutrition guidelines in municipally-funded recreation and sports facilities. We compared and contrasted facilities achieving greater versus less success in increasing the healthfulness of food and beverages offered. Analysis results were mapped onto the updated CFIR [1] to identify factors contributing to the greater success and strategic variation. The CFIR constructs that distinguished More and Less Successful facilities provide a useful starting point for further refinement of implementation supports that contributed to more successful outcomes. However, non-distinguishing constructs can also bring attention to critical points of intervention; for example, when emerging themes identified factors impeding implementation efforts across the broader recreation and sport facility food environment. Findings help to identify areas of action to further support implementation of voluntary nutrition guidelines in these and other jurisdictions. The analysis highlighted three central themes: 1) dealing with the revenue conundrum; 2) building relationships that support implementation; and 3) implementing processes that action change.

6.4.1 The Revenue Conundrum

Provincial governments introduced nutrition guidelines for recreation and sport facilities to support their broader health mandate. It fell to each facility, however, to implement the guidelines. Concern about revenue emerged as one of the main threats to implementation. Across facilities participating in this study, many actors saw the innovation as ‘the right thing to do’, however, even among those who bought in, perceived patron acceptance was a worry.

Many held the belief that patron preferences aligned with traditional 'arena food culture'; existing norms around customer expectations were identified within themes across multiple constructs. Norms for recreation and sport facility food environments, which are historically unhealthy (e.g., French fries, slushies), and perceived expectations around availability of these traditional food options conflicted with nutrition guidelines requiring healthier food offerings. This incompatibility was anticipated to manifest in reduced facility business (with the assumption that patron demand for healthier options would be low) and from that, the belief that implementing provincial guidelines was not financially viable. Consequently, Innovation Cost, specifically whether facilities saw the guidelines as affordable, was a key factor in how far they adopted them. Revenue related themes emerged in numerous implementation constructs across Inner Setting, Individuals, and Implementation Process domains. For the Less Successful facilities, perceived cultural norms amplified many of the constructs that were distinguishing, such as structural, relative priority, cost, and the individual needs of both the innovation recipients (facility patrons) and providers (food service providers).

Revenue focused fears have been identified as a significant barrier to increasing healthfulness of the recreation and sport facility food environment across the implementation literature [13, 146, 12, 44, 136]. This has also been a barrier to nutrition policy and guideline implementation in other public sector settings, such as schools and healthcare facilities [160, 44, 136]. As in the current study, this was based upon expectations of patron dissatisfaction with product offerings resulting in reduced sales volume and the perceived higher costs associated with providing healthier options [13, 44, 136, 146, 160, 12].

These fears, however, may be unfounded. There is literature, including our own findings from the Eat, Play, Live trial, demonstrating that sales reflect proportional availability of unhealthy and healthy options [161, 52, 162]. Moreover, the research by Olstad et al. [52] demonstrated that sales proportionality was maintained when proportions of healthier options available increased. Further to availability, Pechey et al. [162] demonstrated that increasing availability for either healthier or less-healthy snacks resulted in increases in choices from the increased category with the odds of selecting a healthier snack 2.5 times higher in the increased healthier condition versus equal provision of healthy/less healthy options.

The proportional availability and revenue relationship has also been investigated further [54, 55, 107]. A recent study by Blake et al. [54] evaluated the implementation and sales impact of a capacity building intervention to reduce the sales proportion of sugar-sweetened beverages in Australian sporting facilities. The goal was to ‘nudge’ consumers choice by increasing beverage displays of *Green* (most healthy, e.g., water) while decreasing *Red* (least healthy, e.g., full sugar soft drinks). At the end of the two-year intervention authors found displays of *Red* beverages decreased by 17% and display of *Green* beverages increased by 16%. Across study facilities where sales data were available (non-seasonal n=15) sales volume of *Red* beverages decreased by 11%. Further, there was no significant revenue change associated with the change in *Red* beverage sales or evidence of revenue change when compared to expected sales [54] supporting the sustainability of beverage sales with proportional shift. Similarly, Wolfenden et al. [55] in an intervention over two and a half winter seasons targeted increasing availability and sales of fruit and vegetables in sporting facility canteens. Wolfenden also included a promotional strategies component (meal deals, reduced pricing) to support the healthier

choices. Increased availability and sales of fruit and vegetable offerings were reported, and with these increases, there was no significant difference in revenue between intervention and control group facilities. This demonstrated that the combination of pricing and availability can overcome perceived revenue barriers to providing healthier offerings even where less healthy options remain available. Finally, looking at vending only, which plays an important role in recreation and sport facility food environments, Rosi et al. [107] demonstrated that increasing healthier products and decreasing unhealthy products resulted in corresponding changes in sales for both with no change in total purchases. These studies exemplify the ‘success stories’ that facility CBI Leads were looking for to help alleviate the fear of revenue loss.

There is also research supporting the viability of healthier options for vending snacks. A recent intervention study by Evans et al. [163] increased availability of healthier vending snack product offerings in sports facilities in the U.K. and was able to achieve reductions between 20-30% in energy, fats, sugar, and salt in products purchased from vending machines across an eight-month intervention while maintaining sales levels. One of the strengths with this research, was that product changes were made using a stepped approach with like-for-like substitutions informed by products available to the vending provider. Such an approach could help alleviate concerns that emerged in our study around the potential for the nutrition guidelines to limit options. Providing user-friendly, easily accessible and regionally targeted product sourcing resources identifying healthier substitutes, could ease the transition to healthier product offerings for food service providers. This easily actionable approach has the potential to alleviate food service providers’ revenue concerns around maintaining sales volumes when transitioning to healthier offerings.

The perception of patron preferences can also be questioned; ‘cultural’ norms can shift over time. Such perceptions may not be borne out. In the current study, where objective assessment information was collected, it was identified that some patrons are on board and desire healthier options, especially for their children. This shift can be evidenced by the decline in sugar-sweetened beverage intake in Canada [164]. Recognizing the reality of norms changing and a shift in patron preferences means perceptions also have to change.

Finally, it is important to recognize facilities that embraced improving the food environment did so even with revenue concerns by availing themselves of a range of supports available. While revenue factors remain a concern that must be accommodated with guideline implementation efforts, all facilities made some positive change and made greater improvements than the non-intervention facilities [4].

6.4.2 Relationships are Critical

Relational connections and communication factors were the leverage points for all intervention actions taken to further guideline implementation. The relationship between the EPL study Provincial Coordinators and facility-level support communities was among those that facilitated success. Public health dietitians (PHRD) were also a key collaboration for facilities and the relationship critical to actioning change. Overall, teaming: the coordination and collaboration processes that support actioning implementation tasks [1], was more apparent in the More Successful facilities; there was stronger collaboration between the EPL provincial coordinators and the CBI Leads, as well as between CBI Leads, PHRDs and food service providers. As all facilities experienced some success, this reinforces the importance of implementation supports for community interventions.

As would be expected given their role in the EPL intervention, all facilities identified the EPL Provincial Coordinator as critical to implementation planning and activities for actioning change. The critical role of this implementation resource has also been identified elsewhere in policy and implementation literature [137]. Other interventions have benefitted from a designated support person [55, 165]. Further affirming this implementation support role using a systems-based approach, Boelsen-Robinson et al. [166] identified and mapped factors associated with successfully shifting the healthfulness of health-services and recreation and sport facility food retail environments. A dedicated position to support and build relationships and guide resource use was among the factors identified to enhance capacity. This indicates that jurisdictions introducing nutrition policy can facilitate adoption, especially during the early phases, by investing in human and other resources to support the implementation process.

All facilities also identified the importance of the local PHRD as a resource, however, the More Successful facilities had stronger relationships with the PHRD which translated to greater interaction and implementation activity support. The expertise of PHRDs was critical for nutrition guideline support. The value of focused nutrition support has also been demonstrated in the research targeting sugar sweetened beverage reduction in Australian recreation and sport facilities. The provision of nutrition expertise resulted in an increase in healthier beverage options and decrease in less healthy options in one intervention [165], relative to just the decrease in the unhealthy beverages in an intervention where such expertise was not available [55].

The importance of dietitians as a dedicated resource has also been repeatedly shown in research on implementing nutrition policy in health services [167], other public sector

workplace [146] and school [135] food environments. In Ontario, Canada, support from public health dietitians was critical to supporting school food and beverage policy development and implementation [160]. Further, in other research, a lack of expertise was identified as a barrier to improving community sport settings food environments [13]. The expectation for staff and management to interpret nutrition guidelines is unrealistic and impractical. PHRDs have the necessary expertise for guideline interpretation and application and can mitigate challenges identified with the nutrition guideline complexity. Since dietitians are experts in foods and nutrition and public health dietitians in Canada have a mandate to work with communities and organizations in facilitating healthy eating interventions, the current study adds to the strong support for formalizing the role of dietitians in implementing nutrition guidelines in recreation settings.

Both the EPL provincial coordinators and PHRDs facilitated food service provider capacity to increase the provision of healthier recreation and sport facility food offerings compliant with provincial guidelines. Engaging food service providers emerged as a key process factor in successful nutrition guideline implementation across multiple constructs, whether through helping to allay revenue and product availability concerns, supporting skill development or facilitating their input and buy-in. Such engagement aligns with a 2023 [146] review of research addressing the implementation of healthy food and beverage policies in public sector workplaces (e.g., healthcare facilities, recreation and sport facilities, government agencies). The authors found that with food service providers, approaches that were prescriptive, rather than collaborative, were a barrier to building rapport and buy-in [146]. Supporting such approaches, Huse et al. [168] demonstrated the feasibility and acceptability of co-developing a pricing

intervention which resulted in a significant decrease in the sale of unhealthy items in aquatic and recreation and sport facilities. Others have also identified the importance of relationship building and communications in reducing food service providers' resistance and facilitating implementation. Therefore, considering their stake in the implementation, an open, collaborative approach with representation of facility food service providers should be considered as necessary for any facility nutrition guideline implementation team.

Also of note, CBI Leads in the More Successful facilities demonstrated greater capability around knowledge of guidelines and engaging with and utilizing EPL resources even though access to supports was equal. The EPL team guided facilities in the development of implementation plans, however, available supports were not fully accessed or utilized by Less Successful facilities. This may be a reflection of leadership roles for the facility. Stronger leadership and championing of guideline implementation were more apparent in the More Successful facilities. Both strong leadership and champions have been well-established as key implementation facilitators so the advantage this provided is not surprising [143, 136, 167, 137, 138]. Support and encouragement at municipal and management levels was identified and important to prioritizing a healthier food environment. Therefore, moving forward, ensuring implementation supports specifically target high and mid-level leadership and address engagement of those filling these roles should be seen as a primary step in actioning change.

Overall, these results suggest that while implementation supports must be individualized to the facility context, focus on guidance to support teaming and engaging for future implementation activities could support improved outcomes. Further, given the continuing implementation arc for voluntary nutrition guidelines, the need for an ongoing relationship-focused support

systems is indicated. Therefore, in the context of voluntary guidelines, with no compliance deadlines, a system of continuing relationship-based supports would be beneficial. An ongoing platform for interconnection could support moving closer to full guideline alignment. For example, facilities that are limited by structural barriers, would then have implementation support once able to make changes. Communities of practice, as such a platform for sharing resources and experience, have been identified as valuable for supporting and prioritizing change [169, 12]. CBI Leads recommended such a system to advance guideline implementation.

6.4.3 Actioning Change

Provincial nutrition guidelines recognize that a healthy food environment is consistent with the overall mission of municipally funded recreation and sport facilities. The participating facilities had also ‘bought-in’ to this premise to varying degrees. However, it is important to note that agreeing to participate in the EPL intervention was an indication of prioritizing the healthfulness of the food environment, so this was to be expected. The differences reflected in the More and Less Successful facilities could reflect a range of contextual factors such as the strength of that endorsement, where in relation to the decision-making hierarchy participation was approved, competing priorities, and the autonomy of individual leadership roles.

This research found success through endeavour; even small visible changes (e.g., in product, promotion, placement) motivated further action and big changes associated with facility-level policies and processes such as monitoring, supported the biggest outcomes. For the More Successful facilities, Tension for Change, Relative Priority, and Mission Alignment manifested more strongly than in Less Successful facilities. Those within More Successful facilities seemed to place a higher value on the healthfulness of the environment in relation to financial

responsibilities. All facilities experienced some resistance to change as would be expected, however, the More Successful facilities demonstrated a greater valuation and prioritization of improvements to the healthfulness of the food environment, particularly regarding children and youth. As such, an important consideration was supporting patrons making healthier choices through ensuring healthier options in vending machines, identifying healthier options on menus, and providing other informational supports. Although the Less Successful facilities also made some effort toward similar change, concerns around prescriptive guidance and patron autonomy impeded action. Communications targeting the value of nutrition guidelines in this environment coming from external (e.g., provincial) sources could lessen these concerns and support change action.

EPL incorporated training [4] for implementation planning with use of defined tasks and assigned responsibilities, however, there were notable differences among CBI Leads in planning and actioning goals and tasks. Analysis identified that for those in the role of CBI Lead, the ability to action change, the level of engagement, and conflicting priorities impacted facility actions and outcomes related to guideline adherence. The desire to see change is insufficient for this role; those positioned as CBI Leads must also have authority or influence action change. For example, in one of the More Successful facilities, the CBI Lead was not in a position to institute a facility nutrition policy, however, they were in position to obtain necessary authority with the result of a facility policy being put into place impacting food service contracts moving forward. For implementing nutrition guidelines, this research demonstrates the importance of integrating guideline implementation responsibility within employment roles within the facility hierarchy to streamline planning, action, and engagement and embed accountability. With a

defined role and authority, training could be more focussed, nutrition guideline CBI Leads more engaged and empowered, ambiguity of planned activities reduced, and the likelihood of follow-through on planned activities increased relative to that observed in the current trial facilitating continued action towards implementation targets.

Contracts were a predominant structural characteristic for most food service in the case facilities at the time of this study and directly impacted facility's ability to initiate change over the course of the EPL intervention. The EPL CBI and the current research were influenced by non-modifiable barriers like existing contracts. As indicated by the implementation literature [170], context factors need to be considered as part of the implementation planning process so that action can be directed to points where there is leverage [151]. However, contracts that included stipulations to provide healthier offerings facilitated nutrition guideline implementation, as was found with vending contracts across all EPL facilities [145]. The More Successful facilities, overall, had more supportive contracts in place although, the Less Successful facilities did have some supportive contracts. Yet, even where supportive contracts were in place, the current research identified that accountability for monitoring and enforcement was often unclear indicating guidance on positioning and actioning this aspect of contract development is critical to ensure contract enforcement. Resources such as those available through EPL can help with writing and negotiating contracts as they renew.

The traditional arena food culture clashed with both perceived mission alignment and value of nutrition guidelines in recreation setting indicating that changing food norms will be required. Therefore, those actions promoting the value of this being an environment to support healthy eating practices could support the culture shift necessary to make real change. Lessons learned

from actions in school nutrition environments and tobacco control can both support such efforts [171, 172, 135]. A 2019 review of factors influencing implementation of school food policy identified the importance communication and collaboration with key stakeholders and integrating nutrition as core value in relation to school climate; approaches that easily translate to the recreation and sport facility food environment [135]. From tobacco control, the most important considerations identified are that changing norms is a continuing process that takes time, multiple strategies, and, importantly, policy with accountability measures [171, 172]. This suggests that potential for action and shifts in food-based norms in the recreation and sport facility settings.

Recognizing multiple user groups, of which a high proportion were children and adolescents, was also a consideration for recreation and sport facilities food environments. For example, one More Successful facility recognized different food interests of a patron group there for entertainment versus physical activity participation. Lessons to address this perceived conflict can again be taken from tobacco control as well as alcohol control. In Canada, access to both cigarettes and alcohol is restricted by age, suggesting health priorities for minors can co-exist with adult options. While not requiring the same stringent restrictions, one recommendation to address this perceived user-group conflict could be to vary menus and limit availability of some less healthy menu items to when entertainment activities are running, thereby reducing exposure of children to the less healthy options.

This research found that some patrons, parents in particular, would welcome healthier offerings. The literature on this is mixed, however. Some literature identifies parents as strong advocates of healthier food options [173, 17]. Yet, there is also literature to suggest that

parents, as the gatekeepers for the food purchases at recreational facilities, endorse unhealthy offerings as a 'reward' or 'treat' that off-sets the physical activity [174, 175, 44]; purchases made by and for children in this environment can thereby emphasize less healthy traditional offerings. Changing the offerings is insufficient if a significant proportion of parents reinforce unhealthy food practices as normative in association with participation in sport or attendance as a spectator. This parental paradox must be addressed to affect a meaningful food culture shift. As such, one challenge to moving recreation food culture towards a healthier orientation, will require assessing the reality versus the perceptions of parental choices for their children in this setting and tailoring strategies accordingly.

Culture shift takes time. More than once research participants noted that food environment change would have been more effective if the guidelines had been mandated. Although the CBI did result in improvements to facility food environments [4], with voluntary policy, the recreation food environment remained predominantly unhealthy. Other research, in a range of public sector workplaces including recreation and sport facilities, has also demonstrated this [13, 146]. For example, while Blake et al. [54] identified a positive shift in availability and revenue from healthier beverages, only 63% of participating facilities were compliant with the voluntary Australian Healthy Choice Guidelines. Another initiative targeting the removal of sugar-sweetened beverages (SSB) in YMCA aquatic and recreation and sport facilities in Australia found that by the end of the one-year intervention period, while targeted SSBs were reduced, none of the participating facilities had completely removed them [165]. Therefore, mandated policy could be a critical step to expediting change and shifting food norms in this setting.

Transitioning provincial policy from voluntary to mandatory could mitigate many of the challenges identified in the current research. Numerous studies recommend this as an approach to alleviate barriers to improving nutrition profiles in this setting [44, 163, 138, 12, 16]. First, it would provide a clearer endorsement for providing a healthier food environment for those attending municipally funded recreation and sport facilities and better alignment with the overall mission of facilities to be a health promoting setting [56, 51]. Mandated provincial policy would alleviate current contract structural/non-modifiable barriers, eliminate the necessity of negotiating multiple contracts, and address food service providers' concerns with fair competition. However, as identified in this work as well as in the literature on school food and beverage policy, including a mechanism for monitoring compliance would be a critical component of such policy [176, 135, 148].

Research has shown that champions support implementation [138] and our results too showed the benefit of engaged actors at various levels (e.g., implementation of a mandated facility level policy in one of the More Successful facilities). Therefore, finally, but importantly, mandated policy would mitigate the necessity for champions within a facility to create change.

6.4.4 CFIR as a Guiding Framework

The current research benefitted from the 2022 Consolidated Framework for Implementation Research (CFIR) update [1] of the original framework of Damschroder and colleagues [149] and its broad application in implementation science intervention research. Using CFIR helped to frame the process of change in response to the Eat, Play Live capacity building intervention for nutrition guideline implementation. The analysis showed which underlying influences and factors differentiated implementation success across all domains. The evaluation also

highlighted the necessity of having a clear understanding of context factors ahead of intervention implementation efforts. It should be noted that CFIR is recommended as a framework to guide interventions at the planning stage. Nevertheless, using it to frame the evaluation of the Eat, Play Live trial helps to identify which aspects of implementing the capacity building intervention made the most difference.

6.4.5 Strengths and Limitations

This study had several methodological strengths. One strength was the use of multiple cases chosen for similar and contrasting CBI results allowing for more substantial and compelling evidence than from a single case. Further strengthening the results were the comprehensive integration and triangulation of data gathered from multiple sources. Bias, including social desirability bias, was reduced with the use of Provincial Coordinators from different provinces conducting the interviews with CBI facility leads. Further, the lead author of the current paper was the Provincial Coordinator from the EPL control province, reducing potential bias with data integration and analysis.

This study is not without limitations. EPL participant facilities self-selected and therefore, may have had a stakeholder or decision-maker with a stronger interest in changing the food environment. Participation was limited to facilities with full concessions open year-round so results may not represent those facilities with seasonal concession or without concessions. However, this allowed a greater depth of understanding by including analysis of both concession and vending operational areas. Another limitation of the study is the inclusion of cases from two of three intervention provinces due to data limitations. While including cases from all three EPL provinces could have strengthened findings and increased generalizability,

representation from two different provinces with similar characteristics suggest results can be applicable for interventions elsewhere.

The food environment portion of the evaluation was based upon audit results of foods offered for sale. Uptake of any changes to the food offerings in response to guideline implementation could only truly be tested assessing patron sales data. Refusal by numerous food service providers to provide this data and incomplete data from others, limited viability of sales data analysis. Therefore, an important consideration for the institution of guidelines in other jurisdictions will be a requirement for sales data to allow policy evaluation to include assessment of patron uptake.

Interviews were conducted with CBI Leads; however, the evaluation may have benefited from interviews with the PH RD and the food service providers directly, rather than relying on the reporting from the CBI Leads and PCs. Future research would benefit from including the voices of other intervention stakeholder roles, such as food service providers and patrons.

Lastly, it is also important to acknowledge the data were collected pre-pandemic. However, findings remain relevant due to the enduring food culture within this community environment.

This study adds to the evidence base guiding approaches to support policy implementation success in this community food environment. A major strength of this research was the rigorous framework driven analysis using the updated CFIR. Utilization of the CFIR allowed comparison of the complex factors influencing guideline implementation in the recreation and sport facility food environment and a clear understanding of factors, both distinguishing greater uptake of provincial guidelines in More versus Less Successful case facilities and those factors that had an

impact on uptake across all case facilities. This allowed identification of key factors to address moving forward with nutrition policy implementation. Utilization of CFIR eases transfer of findings to other jurisdictions, both in Canada and elsewhere, as well as other public sector food environments.

6.5 CONCLUSION

The Capacity Building Intervention (CBI) training, support and resources of the Eat, Play, Live trial enhanced capacity for nutrition guidelines implementation in recreation food facilities and facilitated positive change in the healthfulness of foods offered. The More Successful facilities benefited particularly from partnerships and relationships. EPL provincial coordinators, public health dietitians, and support communities were among the relationships that facilitated success. Effective engagement and ongoing communications were fundamental to those relationships. Leadership with the knowledge, interest, and commitment to prioritize a healthier food environment helped catalyze change. Change is difficult and some barriers were outside the control of facilities, yet all facilities made some positive change in enhancing the healthfulness of food environments. The CBI facility leads who were at the forefront of the current intervention provide concrete recommendations for future implementation of nutrition guidelines. The use of the CFIR to evaluate the CBI allowed identification of areas to direct future implementation support action to optimize nutrition guideline uptake in recreation and sport facility food venues.

6.5.1 Summary Recommendations

In order to foster meaningful change to the healthfulness of recreation and sport facility food environments, the current research points to the following recommendations for provinces or other jurisdictions instituting nutrition guidelines/policy: invest in dedicated and on-going expert implementation support; establish mechanisms for an on-going community of practice among those implementing guidelines; define clear steps in the progression towards full implementation of nutrition targets; develop comprehensive tools and resources to support

revenue concerns and financial viability of the transition to healthier options for food service providers and facilities; create public messaging and setting-specific education campaigns to emphasize the value of healthy eating; and mandate provincial nutrition policy and assign accountability for implementation and monitoring within the regulatory framework.

7 CONCLUSION

7.1 OVERVIEW

Policy action has been recognized a necessary to address the paradox in recreation and sport facility environments between health promoting physical activity and active living opportunities and the abysmally unhealthy food environment [16]. The research in this thesis is positioned within the Eat, Play, Live (EPL) trial which examined the food environments in recreation and sport facilities in three Canadian provinces (BC, AB, NS) with voluntary nutrition guidelines, with and without a capacity-building intervention (CBI), and a non-guideline control province (ON) [39]. The thesis studies addressed the following objectives:

1. Describe recreation and sport facility food environments in the absence of provincial nutrition guidelines.
 - a. Assess the healthfulness of food and beverages offered for sale and vending beverage sales within a convenience sample of recreation and sport facilities in Ontario, Canada and compare between the cohort with a municipal policy banning the sale of water in single-serve plastic water bottles in municipally funded facilities versus the cohort without such a policy.
2. Explore components of the CBI that had the greatest impact on the healthfulness of food environments within recreation and sport facilities in nutrition guideline provinces randomized to receive the EPL CBI.
 - a. Examine the relationships among the implementation factors: guideline mobilization, facility context, and facility-level policy, and changes to the

healthfulness of the food environment in facilities within nutrition guideline provinces randomized to receive the CBI; and

- b. Describe and frame relationships between and among CBI components and changes to the healthfulness of recreation and sport facility food environments using the updated Consolidated Framework for Implementation Research (CFIR) [1].

The three studies making up this thesis work began with an examination of the food environment in the absence of policy. Study 1 (Chapter 4) clearly identified that in the absence of nutrition policy, Ontario municipal recreation and sport facilities food environments were predominantly unhealthy [161]. Findings from Study 1 also demonstrated this environment is susceptible to unintended consequences of other policy applications that reduced healthfulness as was the case with the ban of the sale of water in single-use plastic bottles in some Ontario municipalities. We know from EPL that in the absence of a capacity intervention to support nutrition policy implementation the environment remains unhealthy [4]; however, by the end of the 18-month CBI there was a modest but significant improvement in the healthfulness of the food environment from baseline. Moreover, there was a difference between CBI facilities and their non-intervention counterparts [4]. Studies 2 and 3 aimed to understand the components of the CBI that were most helpful. Study 2 (Chapter 5) and Study 3 (Chapter 6) focused on identifying and evaluating implementation supports that can make the most difference to nutrition guideline uptake. Study 2 aimed to determine which elements of the EPL trial's CBI were most helpful. Implementation factors (guideline mobilization, facility context, and facility-level policy) within facilities receiving the CBI were operationalized and their impact

on the healthfulness of the food environment was assessed using Qualitative Comparative Analysis (QCA) and regression analysis. Study 3 took a multi-case study approach to describe and frame relationships between and among CBI components and changes in healthfulness of facility food environments using implementation theory (the updated Consolidated Framework for Implementation Research (CFIR)) [1]. Evidence is clear that policy combined with strong implementation supports are needed to achieve meaningful change. Findings have direct applicability to jurisdictions looking to improve healthfulness of recreation and sport facility food environments by implementing recreation and sport facility nutrition guidelines and thereby support municipal recreation as a health promoting setting.

7.2 SUMMARY OF KEY FINDINGS

7.2.1 Study 1: Ontario Recreation and Sport Facility Food Environment

Assessment of the Ontario recreation and sport facilities participating in EPL (n=16)

demonstrated that without nutrition policy, the food environment is indeed unhealthy with most food and beverage offerings being energy-dense and nutrient-poor. Furthermore, vending sales data demonstrated that patron purchases mirrored product availability. Importantly, an unintended consequence of municipal policy banning the sale of water in single-use plastic bottles was the higher proportion of less healthy beverages offered and sold in those facilities in municipalities with such a ban (n=8) compared with those without such a ban (n=8). Ironically, these findings also demonstrated the power of mandated policy to shift the healthfulness of this food environment.

7.2.2 Study 2: Guideline Implementation Factors and Changes in Facility Food Environment

Using a mvQCA, Study 2 (Chapter 5) identified that guideline mobilization, facility context elements and facility-level policy played a combined role in the CBI to improve facility food environment healthfulness. In particular, a high level of mobilization was needed for positive change in facility food healthfulness, indicating the importance of increasing mobilization activities, and their intensity, such as choice architecture approaches (e.g., positionality, cueing) and monitoring and enforcement of existing vending contracts. This was affirmed by the multiple regression analysis in which all variables significantly improved vending profiles, but mobilization was most significantly associated with improved healthfulness. Importantly, components of context and facility-level policy were pivotal in supporting the mobilization activities. Thus, attention to strategies focused on context elements (e.g., training, expertise, prioritizing facility food healthfulness) and facility/municipality-level policy development also need to be part of comprehensive approaches to enhance facility food healthfulness.

7.2.3 Study 3: EPL CBI Multiple-case Evaluation Framed by CFIR

In comparing most and least successful case facilities in changing the healthfulness of food and beverage offerings across the 18-month CBI, CFIR [1] in Study 3 allowed identification of areas to direct future implementation support action. From this assessment, the following recommendations for fostering meaningful change to facility food healthfulness are advanced: invest in dedicated and on-going expert implementation support; establish mechanisms for an on-going community of practice among those implementing guidelines; define clear steps in the progression towards full implementation of nutrition targets; develop comprehensive tools and resources to support revenue concerns and financial viability of the transition to healthier

options for food service providers and facilities; create public messaging and setting-specific education campaigns to emphasize the value of healthy eating; and mandate provincial nutrition policy and assign accountability for implementation and monitoring within the regulatory framework. In addition, our analysis found that the more successful facilities leveraged partnerships and relationships; particularly with EPL provincial study coordinators, public health dietitians, and CBI facility support communities. Effective engagement and on-going communications were fundamental to those relationships. Evidence from this research may provide strategic guidance across a range of community settings.

7.3 DISCUSSION

This research provides valuable information and insight around nutrition policy implementation in municipal recreation and sport settings. It can provide strategic guidance for those regions moving to enact healthier food policy in this community setting as well as for those regions working to enhance policy uptake/implementation for guidelines and/or policies already in place. It also provides evidence for CBI policy implementation strategies that may be applicable across a range of community settings beyond recreation and sport facilities.

It is clear from our research in Ontario and the experience of others [161, 39, 12, 13] that recreations food facilities in the absence of policy are unhealthy. It is also clear from our work and that of others that governments and many of those in recreation and sport settings feel that the food environment should align with physical activity and recreation mandates to make this a health promoting setting [51, 50, 17, 2, 67, 68, 69]. What lessons then can be learned from this research on implementing voluntary nutrition policy that can improve the

healthfulness of food and beverages offered for sale? The key recommendations stemming from the analysis of the findings are as follows:

1. Introduce mandatory policy over voluntary guidelines
2. Take a gradual approach to the process of policy implementation
 - a. Introduce progressive nutrient-based targets for the improved healthfulness of beverages and food offered
 - b. Focus change on food service operational areas based on feasibility and expected health impact
 - i. Beverages
 - ii. Packaged snacks
 - iii. Prepared menu items
3. Include monitoring and enforcement mechanisms with roles and responsibilities identified
4. Incorporate choice architecture approaches
5. Develop and maintain on-going policy supports
6. Utilize marketing approaches to support policy acceptance and implementation.

7.3.1 Mandated Nutrition Policy

To support meaningful change in healthfulness of municipally funded recreation and sport facility food environments a mandated policy approach is required. The need for such policy emerged across all three studies. In Ontario, food options were predominantly unhealthy indicating a need for policy action [161]. Further, Study 1 was also able to demonstrate through the ban of water in plastic bottles that mandated policy can indeed change the food environment. In Study 2, facility-level policy emerged as a factor associated with positive change. Mandated policy, such as health stipulations within food service contracts was a powerful contributor to change. In study 3, findings supported a recommendation for

mandated policy and facility representatives, when asked what would support continuing efforts to increase healthfulness, responded that a mandated provincial policy would ease the burden on facilities to develop and enact such policy. Together, these findings support mandated versus voluntary policy approaches.

Voluntary policy has been shown to be more effective than no policy, both in our own EPL work [4] and elsewhere [177], however, it is important to recognize that even with an effective implementation intervention, recreation and sport facility food environments remained predominantly unhealthy [4]. While it is important to applaud small changes and understand the implicit value they hold toward supporting a culture shift, movement toward long-term and sustainable improvements in the healthfulness of this food environment will require more concerted and expansive changes addressed outside of the recreation and sport facility.

Provincially mandated nutrition policy in recreation and sport facilities would ensure an equitable food environment across the province and would extend change beyond those regions with champions or leadership prioritizing healthfulness of food environments. It would ensure a healthier food environment for children and adolescents in this community setting supporting the national Food-EPI recommendation for consistency across areas where children are exposed [16]. Further, specific Food-EPI policy recommendations included strengthening nutrition standards in public sector settings, with recreation centres directly identified as one such setting [16].

7.3.2 Policy Implementation Process

Should Ontario make a move toward nutrition policy in municipally funded recreation and sport facilities, the question becomes how to approach such policy. Lessons learned from this research may be particularly helpful. Sallis [178] recommends making policy changes first, as this allows interventions targeting education and motivation to take place in a more supportive environment. So, where to begin with approaching such policy? To start, there is increasing evidence of impact of proportional availability (e.g., most healthy, least healthy) in relation to facility patron purchases [132, 52]. The impact of increasing the proportions of healthy food offerings has also been demonstrated in private sector settings [179]. Typically, voluntary guidelines have taken this approach [2, 67, 68]. Progressive policy implementation, however, can ease the impact of change for both facility operators and patrons. A step-wise approach was found to be a way to increase stakeholder buy-in in Australian recreation and sport facilities; gradual change in healthy beverage availability was reflected in gradual change in patron healthy beverage purchases [180]. A stepped approach to transitioning vending offerings by decreasing the proportion of *Do Not Sell* items emerged as a facilitator for improving the healthfulness of offerings for one of the case facilities in Study 3. There is also evidence from a study within recreation and sport facilities in England demonstrating the success of a stepped approach to increasing the healthfulness of vending snacks [163]. Further, research on implementing healthy food policies in the health services sector concluded that a gradual, long-term approach was beneficial [167]. With this in mind, using product category proportionality guidelines and taking a stepped approach with implementation deadlines over a defined time period (e.g., achieve x % by year 2, full compliance by year 5) is recommended.

In making change to the healthfulness of the recreation and sport food environment, there may be benefits in starting with beverages and moving progressively to packaged snack foods and then prepared concession items. Such an approach will allow facilities the opportunity to plan for and adjust the food environment as well as allowing food service providers and suppliers time to adjust to the updated food guidelines; for example, sourcing compliant snacks and menu items. Further, it gives patrons time to adapt to a change in more traditional recreation and sport facility offerings.

Overall, feasibility, health benefit and efficacy all indicate that beverage vending may be a good starting point for introducing nutrition policy for recreation and sport facilities. High sugar-sweetened beverage (SSB) consumption among Canadians suggests targeting SSBs as a starting point for policy within recreation and sport facilities [164]. There is also evidence that youth sports participants consume more sugar than recommended and that SSBs are responsible for much of that consumption [181] further supporting the need to prioritize SSB restrictions in recreation environments. Interestingly, the COMPASS study found that secondary students in Alberta had both greater intake and availability of SSBs in school vending machines compared to Ontario secondary school students [182]. The difference between the two provinces in this instance is that Ontario has a mandated school food policy (P/PM150) banning the sale of SSB [88] whereas Alberta's school food policy [67] is voluntary (and part of the same guidelines recommended for recreation and sport facilities). We also know that proportional availability of *Sell Most* and *Do Not Sell* beverages reflected proportional sales in Ontario facilities participating in EPL [161], suggesting that restricting SSBs could reduce consumption but not

revenues. Finally, regression analysis in Study 3 indicated vending was more responsive to change than concessions.

The need for clear and specific policy requirements as well as administrative processes, which would include monitoring, has also been identified [135, 147]. In Study 3, monitoring and enforcement with well-defined accountability emerged as a recommendation. Indeed, with Study 2, mobilization actions that contributed to enhancing healthfulness of food offerings included enforcement. Therefore, monitoring and enforcement provisions, including interim targets, are also a critical component of such an approach. Clearly positioning responsibility for implementation, monitoring and enforcement as well as consequences for non-compliance is required to ensure successful implementation [146, 136, 16, 147]

Beyond specifying nutrient allowance limits (e.g., x % sugars), policy provisions extending to choice architecture approaches, including product positioning, visibility, point-of-purchase (POP) restrictions, and menu labelling, could support an improved food environment. Research continues to add evidence of the effectiveness of such approaches [131, 132, 54, 133].

Positionality, such as product proximity, has been identified as being able to influence patron choices [131]. Similar to positionality, product visibility targets increased visibility of healthier options while also reducing visibility of less healthy options. Reducing visibility, while not restricting access, has been demonstrated to reduce patron purchases of the less healthy options [132, 54]. Nudging has also been shown to increase sales of the healthier nudged products [133]. Restrictions for product display at POP is also recommended as part of this approach, whether permitted distance from cash register for less healthy options (proximity guidelines) and/or guidelines for what can be positioned at POP. Cohen and Lesser [183] assert

that because most food decisions are unconscious, limiting exposure to unhealthy food and beverage options at POP maintains consumer choice while supporting healthy food decision-making. Menu labelling approaches, such as identifying healthier items or using traffic light labels, have also been demonstrated to improve healthfulness of patron choices [98]. A final recommended change would be the removal of deep fryers, effectively impacting patron choice by eliminating the option for deep fried menu items.

As part of implementing a restrictive policy approach, availability of appropriate supports is critical. The benefit of the centrally delivered EPL training session emerged for both Study 2 and 3, where CBI actors remained constant across the intervention period. Extending this support, a recommended process to build facility capacity to implement nutrition guidelines is on-going training; a facilitator which also supported food policy implementation in other settings [141]. Such training could be a requirement for those working directly in food service in this setting, similar to requirements for safe food handling. Training should also be available, and recommended, for facility management as well as local and municipal partners to ensure a full understanding of the guidelines and resources available.

Dedicated expert nutrition support available to stakeholders working with or within recreation and sport facility food service was also considered necessary to ensure informed food environment decisions and practices (Study 2) and supported success (Study 3). Expertise has been identified as helpful in supporting implementation across a range of scenarios, including recreation and sport facility environments [146, 167, 165], confirming the need to integrate the role of dietitians. Such experts guide the development and maintenance of product support resources such as those utilized with the EPL CBI [184] as well as expedite new technologies.

Dietitians have been, for example, identified as essential to improving artificial intelligence (AI)-enabled image recognition applications for nutrition care [185]; technology that could readily translate to advancing food service understanding of healthfulness of both prepared and packaged food offerings. Finally, attention to the development of simplified tools to support food service providers product management is needed; for example, an easy-to-use product listing of provincially available snacks and beverages that meet the nutrition policy guidelines similar to what was provided by Evans et al. [163] for product substitutions to increase healthfulness of vending snacks and Ziraldo et al. [186] to help school food services identify acceptable products. Providing simple guidelines combined with expert support and resources would alleviate the need for facility representatives, municipal partners, and food service providers to have nutrition expertise, which has been repeatedly found they do not have [13], and reduce the burden of guideline implementation for facilities and food service providers.

It is important to recognize that implementation of nutrition policy in the recreation and sport environment will be met with some resistance. Study 3, for example, found that food service providers fears around perceived revenue losses strongly influenced voluntary guideline uptake. There is also an abundance of literature identifying such fears as a challenge with nutrition policy in public settings [13, 136, 12, 44, 146]. Much of the push for such change is coming from public health concerns. Much of the resistance to change is coming from food service providers concerns for market viability. So, rather than simply acknowledging that the shifting of norms takes time, directly targeting market demand could be included with implementation. Proctor et al. [187] suggest that market viability and leveraging approaches from entrepreneurship could advance adoption (e.g., nutrition guidelines). The authors

contend: *“The question is how market analysis can best inform and facilitate implementation processes, not whether it should”* [187, p. 7]. One suggestion was the development of toolkits for market viability assessment. They asserted that the addition of such tools could support communication and collaboration of the multidisciplinary stakeholders [187]. Proctor et al. [187] also maintain that ‘push-out’ is insufficient and that cultivating demand is important for both adoption and sustainability. Consequently, health promotion education and marketing approaches targeting the value healthier food options and to facilitate policy acceptance in recreation and sport facilities is recommended.

Finally, nutrition policy does not need to extend beyond facility concession and vending operational areas. In Ontario, only two of the seventeen participating facilities had a restaurant (licensed) on site. This recognizes that some of these facilities are also entertainment venues with a larger adult audience. Different rules could apply to such venues.

7.3.3 Broader Health Policy Approaches

The focus of this thesis has been to identify processes to enable the implementation and effectiveness of nutrition guidelines/policy in public recreation and sport facility food environments. Ideally, such policy would not occur in isolation. A broad public health approach with a health-in-all policy (HiAP) requirement for all provincial and municipal contracts would be preferred as supported by the Food-EPI Canada research [59]. With roots in the Ottawa Charter [15], HiAP is defined as follows:

“an approach to public policies across sectors that systematically takes into account the health implications of decisions, seeks synergies, and avoids harmful health impacts in

order to improve population health and health equity.” [188, p. i17, 189, p. i20]

This would alleviate the disruption of implementing policy in each setting (such as schools, recreation and sport facilities and health settings) and support more comprehensive approaches and benefits. Taking an HiAP approach could address several of the challenges related to improving the healthfulness of municipal recreation and sport facility food environments. Findings from Study 1 and Study 3 both support the value of an HiAP approach given HiAP consideration of the impact of policies and decisions made at different levels of government [189]. With the case study facilities in Study 3, one of the challenges to actioning change was standing contracts, a limitation that has been identified across the literature [13]. HiAP would mitigate any identified structural challenges around the positioning of contracts for different operational areas across facilities and any inconsistencies resulting from differing contract jurisdictional levels. For example, a facility may have a municipal level beverage contract and a facility-level concession contract, and provincial policy would ensure alignment of nutrition requirements for both. Such a policy would also ensure that potential health consequences be accounted for with any contracts involving publicly funded spaces. As, for example, demonstrated in the Ontario arm of EPL in Study 1, the consequences of banning the sale of water in single-serve plastic bottles while still allowing the sale of unhealthy beverages in single-serve plastic bottles put some Ontario facilities in the position of only being able to sell less healthy beverages [161]. Even with the increasing water options in cans and other packaging (e.g., boxed), recreation and sport facility beverage vending machines typically do not accommodate these options (being designed for plastic bottles) limiting potential

availability of healthier options to hours that concessions are open. HiAP would require consideration of healthy beverage availability in weighing any change.

The use of a HiAP policy approach would also reduce the burden on individual facilities for developing nutrition policy. Further, taking an HiAP approach helps position recreation and sport facilities as a health promoting setting. This also ensures an equitable food environment across municipal settings rather than relying on the interest and capacity of facility/municipal management. This in turn would support normalizing a healthier food within recreation and sport facilities. Changing norms is a long, slow process and this step advances such change.

7.4 LIMITATIONS

This research included a self-selected, convenience sample of only 33 (CBI n=17; ON n=16) municipally funded recreation and sport facilities across four Canadian provinces (BC, AB, ON, NS) which could indicate a pre-existing interest by stakeholders or decision-makers to improve facility food environments. Facilities were also not blinded to audits. However, generalizability may be supported given the real-world design, range of facility sizes, and multiple province representation. Furthermore, this is the largest study of its' kind to date with facilities that were randomized to the intervention or non-intervention control.

7.5 SCHOLARLY CONTRIBUTIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH AND PRACTICE

The research in this thesis adds to the literature supporting nutrition guideline implementation in community settings with real world community-based evidence. Study 1 (Chapter 4) demonstrated that without policy recreation and sport facility food environments in Ontario were generally unhealthy. Yet, findings also demonstrated that mandated policy can be effective (even if it consequentially reduced the healthfulness of available options). The novel use of Multi-value Qualitative Comparative Analysis (mvQCA) in Study 2 (Chapter 5) allowed analysis of factors with complex and varied relationships within a small number of cases and provided insight into how those relationships impacted each other. Looking at the strength of those relationships, the use of regression analysis affirmed results emphasizing mobilization activities, as well as highlighting that statistical analysis approaches alone may not provide a decisive understanding of the complex relationships influencing change in community settings. The suite of action areas that enhanced nutrition guideline uptake in recreation and sport facility food environments may have relevance for implementation in other settings. Study 3 (Chapter 6) further extended this understanding by identifying points of action for implementation strategies in recreation and sport food environments aligned with the CFIR [1]. Use of CFIR increases transferability of these findings to other community settings and jurisdictions and increases comparability of findings across jurisdictions thereby supporting understandings within implementation science more broadly. Recommendations stemming from Study 3 findings as well as recommendations for future implementation supports emerging from facility representatives can be used to support healthy policy approaches across community and municipal food environments.

Recommendations for future research on nutrition policy implementation are:

1. Examine the effects of practice recommendations described under section [7.3](#);
2. Conduct further controlled trials that extend and endorse EPL by integrating multiple stakeholders in trial development and assessing implementation resources, sales outcomes, and patron responses;
3. Evaluate the nutrition and health outcomes of public health policy implementation.

Changing recreation and sport facility food environments can seem a daunting task. This research and the recommendations stemming from it can ease the process of nutrition guideline implementation and ultimately support health.

REFERENCES

- [1] L. J. Damschroder, C. M. Reardon, M. A. O. Widerquist and J. Lowery, "The updated Consolidated Framework for Implementation Research based on user feedback," *Implementation Science*, vol. 17, no. 75, p. 16, 2022.
- [2] British Columbia Ministry of Health, "Healthier Choices in Vending Machines in B.C. Public Buildings Policy," April 2014. [Online]. Available: <https://www2.gov.bc.ca/assets/gov/health/managing-your-health/healthy-eating/vending-policy-2014.pdf>. [Accessed 2020].
- [3] S. N. Partington, T. J. Menzies, T. A. Colbourn, B. E. Saelens and K. Glanz, "Reduced-item food audits based on the nutrition environment measures survey," *American Journal of Preventive Medicine*, vol. 49, no. 4, pp. e23-33, 2015.
- [4] D. L. Olstad, K. D. Raine, R. J. Prowse, D. Tomlin, S. F. Kirk, J.-L. D. Mclsaac, L. C. Masse, M. S. Caswell, R. M. Hanning, T. Milford and P.-J. Naylor, "Eat, Play, Live: A randomized controlled trial within a natural experiment examining the role of nutrition policy and capacity building in improving food environments in recreation and sport facilities," *International Journal of Behavioral Nutrition and Physical Activity*, vol. 16, no. 51, 2019.
- [5] S.-J. Salvy, K. de la Haye, J. C. Bowker and R. C. Hermans, "Influence of peers and friends on children's and adolescents' eating and activity behaviors," *Physiology and Behavior*, vol. 106, no. 3, pp. 369-378, 2012.
- [6] World Health Organization, "Nutrition: Controlling the global obesity epidemic," Geneva, 2014.
- [7] M. Story, K. M. Kaphingst, R. Robinson-O'Brien and K. Glanz, "Creating healthy food and eating environments: Policy and environmental approaches," *Annual Review of Public Health*, vol. 29, pp. 253-272, 2008.
- [8] J.-L. Mclsaac, S. Jarvis, D. L. Olstad, P.-J. Naylor, L. Rehman and S. F. Kirk, "Voluntary nutrition guidelines to support healthy eating in recreation and sports settings are ineffective: Findings from a prospective study," *Public Health*, vol. 5, no. 4, pp. 411-420, 2018.
- [9] P.-J. Naylor, L. Bridgewater, M. Purcell, A. Ostry and S. Vander Wekken, "Publicly funded recreation facilities: Obesogenic environments for children and families?," *International Journal of Environmental Research and Public Health*, vol. 7, pp. 2208-2221, 2010.

- [10] P. Chaumette, S. Morency, A. Royer, S. Lemieux and S. Tremblay, "Food environment in sport, recreational and cultural facilities in Quebec City: A look at the situation," *Canadian Journal of Public Health*, vol. 100, no. 4, pp. 310-314, 2009.
- [11] D. L. Olstad, S. M. Downs, K. D. Raine, T. R. Berry and L. J. McCarger, "Improving children's environments: A survey of adoption and implementation of nutrition guidelines in recreation facilities," *BMC Public Health*, vol. 11, no. 423, 2011.
- [12] M. Warken, T. Sanden, N. Shanks, R. Engler-Stringer and H. Vatanparast, "A need for multi-sector and multi-pronged solutions to address the many barriers inhibiting change from unhealthy food environments in publicly funded recreation facilities: A mixed-method study," *Applied Physiology, Nutrition, and Metabolism*, vol. 47, no. 8, pp. 847-857, 2022.
- [13] K. Westberg, C. Stavros, L. Parker, A. Powell, D. M. Martin, A. Worsley, M. Reid and F. David, "Promoting healthy eating in the community sport setting: A scoping review," *Health Promotion International*, vol. 37, no. 1, 2021.
- [14] Institute of Medicine Committee on Prevention of Obesity in Children and Youth and; Food and Nutrition Board; Board on Health Promotion and Disease Prevention, Preventing childhood obesity: Health in the balance, J. P. Koplan, C. T. Liverman and V. I. Craak, Eds., Washington, DC: National Academic Press, 2005.
- [15] World Health Organization, "Ottawa Charter for Health Promotion: An International Conference on Health Promotion," 14 11 1986. [Online]. Available: www.canada.ca/en/public-health/health-promotion/population-health/ottawa-charter-health-promotion-international-conference-on-health-promotion.html.
- [16] L. Vanderlee, S. Goorang, K. Karbasy, S. Vandevijvere and M. R. L'Abbe, "Policies to create healthier food environments in Canada: Experts' evaluation and prioritized actions using the Healthy Food Environment Policy Index (Food-EPI)," *International Journal of Environmental Research and Public Health*, vol. 16, no. 22, p. 4473, 2019.
- [17] B. Kelly, K. Chapman, L. King, L. Hardy and L. Farrell, "Double standards for community sports: Promoting active lifestyles but unhealthy diets," *Health Promotion Journal of Australia*, vol. 19, no. 3, pp. 226-228, 2008.
- [18] S. Hack, M. Jessri and M. R. L'Abbe, "Nutritional quality of the food choices of Canadian children," *BMC Nutrition*, vol. 7, no. 16, 2021.
- [19] K. E. Storey, L. E. Forbes, S. N. Fraser, J. C. Spence, R. C. Plotnikoff, K. D. Raine, R. M. Hanning and L. J. McCarger, "Diet quality, nutrition and physical activity among adolescents: The Web-SPAN (Web-Survey of Physical Activity and Nutrition) project," vol. 12, no. 11, pp. 2009-2017, 2009.
- [20] K. W. Bauer, N. I. Larson, M. C. Nelson, M. Story and D. Neumark-Sztainer, "Socio-environmental, personal and behavioural predictors of fast-food intake among adolescents," *Public Health Nutrition*, vol. 12, no. 10, pp. 1767-1774, 2009.

- [21] World Health Organization, "Diet, nutrition and the prevention of chronic diseases: Report of a joint WHO/FAO expert consultation," 2003.
- [22] T. Lobstein, L. Baur and Uauy, "Obesity in children and young people: A crisis in public health," *Obesity Reviews*, vol. 5, no. s1, pp. 4-85, 2004.
- [23] J. Sheperd, A. Harden, R. Rees, G. Brunton, J. Carcia, S. Oliver and A. Oakley, "Young people and healthy eating: A systematic review of research on barriers and facilitators," *Health Education Research*, vol. 21, no. 2, pp. 239-257, 2006.
- [24] R. M. Hanning, S. J. Woodruff, I. Lambraki, P. Driezen and C. C. Murphy, "Nutrient intakes and food consumption patterns among Ontario students in grades six, seven, and eight," *Canadian Journal of Public Health*, vol. 98, no. 1, pp. 12-16, 2007.
- [25] L. Vanderlee, C. Vaillancourt, S. Hamamji and D. L. Olstad, "An in-depth look at risk factors for diet-related noncommunicable disease in Canada Results from INFORMAS Canada - Complementary report," 2025. [Online]. Available: <https://informascanada.com/2025-report>. [Accessed 7 April 2025].
- [26] A. A. Lake, A. J. Adamson, A. M. Craigie, A. J. Rugg-Gunn and J. C. Mathers, "Tracking of dietary intake and factors associated with dietary change from early adolescence to adulthood: The ASH30 study," *Obesity Facts*, vol. 3, pp. 157-165, 2009.
- [27] A. A. Lake, J. C. Mathers, A. J. Rugg-Gunn and A. J. Adamson, "Longitudinal change in food habits between adolescence (11-12 years) and adulthood (32-33 years): The ASH30 study," *Journal of Public Health*, vol. 28, no. 1, pp. 1-16, 2006.
- [28] V. Mikkila, L. Rasanen, O. T. Raitakari, P. Pietinen and J. Viikari, "Longitudinal changes in diet from childhood into adulthood with respect to risk of cardiovascular diseases: The Cardiovascular Risk in Young Finns Study," *European Journal of Clinical Nutrition*, vol. 58, pp. 1038-1045, 2004.
- [29] A. M. Craigie, A. A. Lake, S. A. Kelly, A. J. Adamson and J. C. Mathers, "Tracking of obesity-related behaviours from childhood to adulthood: A systematic review," *Maturitas*, vol. 70, pp. 266-284, 2011.
- [30] E. Z. Movassagh, A. D. Baxter-Jones, S. Kontulainen, S. J. Whiting and H. Vatanparast, "Tracking dietary patterns over 20 years from childhood through adolescence into young adulthood: The Saskatchewan Pediatric Bone Mineral Accrual Study," *Nutrients*, vol. 9, no. 9, p. 990, 2017.
- [31] F. Cruz, E. Ramos, C. Lopes and J. Araujo, "Tracking of food and nutrient intake from adolescence into early adulthood," *Nutrition*, Vols. 55-56, pp. 84-90, 2018.
- [32] A. G. Rundle, P. Factor-Litvak, S. F. Suglia, E. Susser, K. L. Kezios, G. S. Lovasi, P. M. Cirilla, B. A. Cohn and B. G. Link, "Tracking of obesity in childhood into adulthood: Effects on body mass index and fat mass index at age 50," *Childhood Obesity*, vol. 16, no. 3, pp. 226-231, 2020.

- [33] E. Evensen, T. Wilsgaard, A.-S. Furberg and G. Skeie, "Tracking of overweight and obesity from early childhood to adolescence in a population-based cohort - the Tromsø Study, Fit Futures," *BMC Pediatrics*, vol. 16, no. 64, 2016.
- [34] M. Simmonds, A. Llewellyn, C. G. Owen and N. Woolacott, "Predicting adult obesity from childhood obesity: A systematic review and meta-analysis," *Obesity Reviews*, vol. 17, no. 2, pp. 95-107, 2015.
- [35] R. Engler-Stringer, A. Gerrard and N. Muhajarine, "The community and consumer food environment and children's diet: A systematic review," *BMC Public Health*, vol. 14, no. 522, 2014.
- [36] C. A. Roberto, B. Swinburn, C. Hawkes, T. T.-K. Huang, S. A. Costa, M. Ashe, L. Zwicker, J. H. Cawley and K. D. Brownell, "Patchy progress on obesity prevention: Emerging examples, entrenched barriers, and new thinking," *The Lancet*, vol. 385, no. 9985, pp. 2400-09, 2015.
- [37] Government of Canada, "Health Canada's Healthy Eating Strategy," 14 01 2021. [Online]. Available: <https://www.canada.ca/en/services/health/campaigns/vision-healthy-canada/healthy-eating.html>.
- [38] Government of Canada, "Canada's Food Guide," 17 02 2022. [Online]. Available: <https://food-guide.canada.ca/en/>.
- [39] D. L. Olstad, R. L. Prowse, K. D. Raine, D. Tomlin, S. F. Kirk, J.-L. D. McIsaas, L. C. Masse, M. S. Caswell, R. M. Hanning, T. Milford and P.-J. Naylor, "Baseline results from the Eat, Play, Live trial: A randomized controlled trial within a natural experiment examining the role of nutrition policy and capacity building in improving food environments in recreation and sport facilities," *Food Policy*, vol. 92, 2020.
- [40] P.-J. Naylor, S. Vander Wekken, D. Trill and Kirbyson, "Facilitating healthier food environments in public recreation facilities: Results of a pilot project in British Columbia, Canada," *Journal of Parks and Recreation Administration*, vol. 28, no. 4, pp. 37-58, 2010.
- [41] D. L. Olstad, K. D. Raine and I. J. McCarger, "Adopting and implementing nutrition guidelines in recreation facilities: Public and private sector roles. A multiple case study," *BMC Public Health*, vol. 12, no. 376, 2012.
- [42] M. Nowak, Y. Jeanes and S. Reeves, "The food environment in leisure centres and health clubs: How appropriate is it for children?," *Nutrition & Food Science*, vol. 42, no. 5, pp. 307-314, 2012.
- [43] M. B. Irby, M. Drury-Brown and J. A. Skelton, "The food environment of youth baseball," *Childhood Obesity*, vol. 10, no. 3, pp. 260-265, 2014.
- [44] L. Garnweidner-Holme, H. S. Haugland, I. Joa, V. H. Telle-Hansen, G. O. Gjevestad and M. C. Myhrstad, "Facilitators and barriers to healthy food selection at children's sports arenas in Norway: A qualitative study among managers and parents," *Public Health Nutrition*, vol. 24, no. 6, pp. 1552-1558, 2021.

- [45] B. Kelly, L. King, A. E. Bauman, L. A. Baur, R. Macniven, K. Chapman and B. J. Smith, "Identifying important and feasible policies and actions for health at community sports clubs: A consensus-generating approach," *Journal of Science and Medicine in Sport*, vol. 17, pp. 61-66, 2014.
- [46] S. Allender, E. Gleeson, B. Crammond, G. Sacks, M. Lawrence, A. Peeters, B. Loff and B. Swinburn, "Policy change to create supportive environments for physical activity and healthy eating: Which options are the most realistic for local government?," *Health Promotion International*, vol. 27, no. 2, pp. 261-274, 2012.
- [47] S. Vander Wekken, S. Sorensen, J. Meldrum and P.-J. Naylor, "Exploring industry perspectives on the implementation of a provincial policy for food and beverage sales in publicly funded recreation facilities," *Health Policy*, vol. 104, pp. 279-287, 2012.
- [48] J. Meganck, J. Scheerder, E. Thibaut and J. Seghers, "Youth sports clubs' potential as health-promoting settings: Profiles, motives and barriers," *Health Education Journal*, vol. 74, no. 5, pp. 531-543, 2015.
- [49] S. F. Kirk, D. L. Olstad, J.-L. D. McIsaac, R. J. Prowse, S. Caswell, R. Hanning, K. D. Raine, L. C. Masse and P. J. Naylor, "Appetite for change? Facilitators and barriers to nutrition guideline implementation in Canadian recreation facilities," *Health Promotion International*, vol. 36, no. 6, pp. 1672-1682, 2021.
- [50] S. Kokko, A. Donaldson, S. Geidne, J. Seghers, J. Scheerder, J. Meganck, A. Lane, B. Kelly, M. Casey, R. Eime, J. Villberg and L. Kannas, "Piecing the puzzle together: Case studies of international research in health-promoting sports club," *Global Health Promotion*, vol. 23, no. Suppl 1, pp. 75-84, 2016.
- [51] J. Robertson, R. Eime and H. Westerbeek, "Community sports clubs: Are they only about playing sport, or do they have broader health promotion and social responsibilities?," *Annals of Leisure Research*, vol. 22, no. 2, pp. 215-232, 2019.
- [52] D. L. Olstad, L. A. Goonewardene, L. J. McCarger and K. D. Raine, "If we offer it, will children buy it? Sales of healthy foods mirrored their availability in a community sport commercial setting in Alberta, Canada," *Childhood Obesity*, vol. 11, no. 2, pp. 156-164, 2015.
- [53] A. Grech and M. Allman-Farinelle, "A systematic literature review of nutrition interventions in vending machines that encourage consumers to make healthier choices," *Obesity Reviews*, vol. 16, pp. 1030-1041, 2015.
- [54] M. R. Blake, H. Romaniuk, D. Riesenberg, T. Boelsen-Robinson, A. J. Cameron, L. Orellana and A. Peeters, "Implementation and sales impact of a capacity building intervention in Australian sporting facility food outlets: A longitudinal observational study," *BMJ Nutrition, Prevention & Health*, vol. 5, no. 2, pp. 171-181, 2022.
- [55] L. Wolfenden, M. Kingsland, B. C. Rowland, P. Dodds, K. Gillham, S. L. Yoong, M. Sidey and J. Wiggers, "Improving availability, promotion and purchase of fruit and vegetable and non sugar-

- sweetened drink products at community sporting clubs: A randomised trial," *International Journal of Behavioral Nutrition and Physical Activity*, vol. 12, no. 35, 2015.
- [56] S. Kokko, "Sports clubs as settings for health promotion: Fundamentals and overview to research," *Scandinavian Journal of Public Health*, vol. 42, no. Suppl 15, pp. 60-65, 2014.
 - [57] K. Glanz, J. F. Saelens and L. Frank, "Healthy nutrition environments: Concepts and measures," *American Journal of Health Promotion*, vol. 19, no. 5, pp. 330-3, 2005.
 - [58] C. Hawkes, T. G. Smith, J. Jewell, J. Wardle, R. A. Hammond, S. Friel, A. M. Thow and J. Kain, "Smart food policies for obesity prevention," *The Lancet*, vol. 385, no. 9985, pp. 2410-2421, 2015.
 - [59] L. Vanderlee, A. McLaughlin, C. Vaillancourt, D. L. Olstad, C. Mah and M. L'Abbe, "Actions to cultivate healthier food environments in Canada: Federal government policies and progress, 2023," [Online]. Available: www.informascanada.com/food-epi-canada-2023. [Accessed 5 April 2025].
 - [60] G. Sacks, B. A. Swinburn and M. A. Lawrence, "A systematic policy approach to changing the food system and physical activity environments to prevent obesity," *Australia and New Zealand Health Policy*, vol. 5, no. 13, 2008.
 - [61] T. Lobstein and L. A. Baur, "Policies to prevent childhood obesity in the European Union," *European Journal of Public Health*, vol. 15, no. 6, pp. 576-579, 2005.
 - [62] M. S. Nanney, R. MacLehose, M. Y. Kubik, C. S. Davey, B. Coombes and T. F. Nelson, "Recommended school policies are associated with student sugary drink and fruit and vegetable intake," *Preventive Medicine*, vol. 62, pp. 179-181, 2014.
 - [63] P. C. Jaime and K. Lock, "Do school based food and nutrition policies improve diet and reduce obesity?," *Preventive Medicine*, vol. 48, pp. 45-53, 2009.
 - [64] C. Fung, J.-L. D. McIsaac, S. Kuhle, S. F. Kirk and P. J. Veugelers, "The impact of a population-level school food and nutrition policy on dietary intake and body weights of Canadian children," *Preventive Medicine*, vol. 57, pp. 934-940, 2013.
 - [65] R. Micha, D. Karageorgou, J. Bakogianni, E. Trichia, L. P. Whitsel, M. Story, J. L. Penalvo and D. Mozaffarian, "Effectiveness of school food environment policies on children's dietary behaviors: A systematic review and meta-analysis," *Plos One*, vol. 13, no. 3, p. e0194555, 2018.
 - [66] C. E. Driessen, A. J. Cameron, L. E. Thornton, S. K. Lai and L. M. Barnett, "Effect of changes to the school food environment on eating behaviours and/or body weight in children: A systematic review," *Obesity Reviews*, vol. 15, pp. 968-982, 2014.
 - [67] Alberta Health and Wellness, "Alberta Nutrition Guidelines for Children and Youth: A childcare, school and recreation/community centre resource manual," 2012. [Online]. Available: open.alberta.ca/publications/5906406. [Accessed April 2020].

- [68] Government of Nova Scotia, "Healthy Eating in Recreation and Sport Settings," 2015. [Online]. Available: www.recreationns.ns.ca/wp-content/uploads/2016/01/HERSS-Guidelines.pdf. [Accessed April 2020].
- [69] Saskatchewan Health Authority, "Healthy Foods for My Recreation Setting Nutrition Standards for Saskatchewan," [Online]. Available: <https://publications.saskatchewan.ca/#/products/92884>.
- [70] Recreation PEI, "Healthy Eating in Recreation Facilities," [Online]. Available: <https://recreationpei.ca/healthy-eating-in-recreation-facilities/>.
- [71] BC Recreation and Parks Association, "Stay Active Eat Healthy," 2021. [Online]. Available: <https://stayactiveeathealthy.ca/>. [Accessed October 2021].
- [72] T. McFadyen, L. K. Chai, R. Wyse, M. Kingsland, S. L. Yoong, T. Clinton-McHarg, A. Bauman, J. Wiggers, C. Rissel, C. M. Williams and L. Wolfenden, "Strategies to improve the implementation in sporting organizations targeting poor diet, physical inactivity, obesity, risky alcohol use or tobacco use: A systematic review," *BMJ Open*, vol. 8, 2018.
- [73] M. Kingsland, L. Wolfenden, J. Tindall, B. Rowland, M. Sidey, P. McElduff and J. H. Wiggers, "Improving the implementation of responsible alcohol management practices by community sporting clubs: A randomised controlled trial," *Drug and Alcohol Review*, vol. 34, no. 4, pp. 447-57, 2015.
- [74] P.-J. Naylor, D. L. Olstad and S. Therrien, "An intervention to enhance the food environment in public recreation and sport settings: A natural experiment in British Columbia, Canada," *Childhood Obesity*, vol. 11, no. 4, pp. 364-374, 2015.
- [75] J. Meganck, J. Seghers and J. Scheerder, "Exploring strategies to improve the health promotion orientation of Flemish sports clubs," *Health Promotion International*, vol. 32, no. 4, pp. 681-690, 2017.
- [76] A. Tashakkori, R. B. Johnson and C. Teddlie, *Foundations of Mixed Methods Research*, Thousand Oaks, California: Sage Publications, Inc., 2021.
- [77] V. L. Plano Clark and N. V. Ivankova, *Mixed Methods Research: A Guide to the Field*, Thousand Oaks, California: Sage Publications, Inc., 2016.
- [78] D. L. Olstad, K. Poirier, P.-J. Naylor, C. Shearer and S. F. Kirk, "Policy outcomes of applying different nutrient profiling systems in recreational sports settings: The case for national harmonization in Canada," *Public Health Nutrition*, vol. 18, no. 12, 2015.
- [79] B. E. Saelens, K. Glanz, J. F. Sallis and L. D. Frank, "Nutrition environment measures study in restaurants (NEMS-R): Development and evaluation," *American Journal of Preventive Medicine*, vol. 32, no. 4, pp. 273-281, 2007.

- [80] Government of Canada, "History of Canada's Food Guides from 1942 to 2007," Health Canada, 05 February 2007. [Online]. Available: <https://www.canada.ca/en/health-canada/services/canada-food-guide/about/history-food-guide.html>. [Accessed 15 June 2025].
- [81] M. Dooris, B. Poland, K. Lloyd, E. de Leeuw, D. S. McCall and J. Wharf-Wiggins, "Healthy settings building evidence for the effectiveness of a whole system health promotion - challenges and future directions," in *Global Perspectives on Health Promotion Effectiveness*, D. V. McQueen and C. M. Jones, Eds., New York, NY: Springer, 2007, pp. 327-352.
- [82] S. Kokko, L. W. Green and L. Kannas, "A review of settings-based health promotion with applications to sports clubs," *Health Promotion International*, vol. 29, no. 3, pp. 494-509, 2013.
- [83] QSR International Pty Ltd., *NVivo 14*, Doncaster, Victoria, 2023.
- [84] M. Sylow and L. Holm, "Building groups and independence the role of food in the lives of young people in Danish sports centres," *Childhood*, vol. 16, no. 2, pp. 213-228, 2009.
- [85] Canadian Heritage, "Sport Participation 2010," Statistics Canada, Ottawa, 2012.
- [86] C. A. Monteiro, G. Cannon, J.-C. Moubarac, R. B. Levy, M. L. C. Louzada and P. C. Jaime, "The UN Decade of Nutrition, the NOVA food classification and the trouble with ultra-processing," *Public Health Nutrition*, vol. 21, no. 1, pp. 5-17, 2017.
- [87] B. A. Swinburn, G. Sacks, K. D. Hall, K. McPherson, D. T. Finegood, M. Moodie and S. L. Gortmaker, "The global obesity pandemic: Shaped by global drivers and local environments," *The Lancet*, vol. 378, no. 9793, pp. 804-814, 2011.
- [88] Ontario Ministry of Education, "Policy/Program Memorandum No. 150," 4 October 2010. [Online]. Available: www.edu.gov.on.ca/extra/ppm/150/html.
- [89] K. Forsyth, D. Labonte, K. Neil, H. McMillan and D. Smith, "Getting started with healthy eating in your recreation setting," *Health, Nutrition Resource Centre at Ontario Public Health Association and Ontario Society for Nutrition Professionals in Public*, 2017.
- [90] L. Vanderlee, S. Goorang, K. Karbasy, A. Schermel and M. R. L'Abbe, "Creating healthier food environments in Canada: Current policies and priority actions - Summary Report," University of Toronto, Toronto, 2017.
- [91] Statistics Canada, "Dictionary Census of Population 2016," 03 01 2019. [Online]. Available: <https://www12.statcan.gc.ca/census-recensement/2016/ref/dict/geo049a-eng.cfm>.
- [92] Statistics Canada, "Census Profile 2016 Census," 26 04 2021. [Online]. Available: <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E>.
- [93] M.-A. Carter, L. N. Signal, R. Edwards and J. Hoek, "Competing teammates: Food in New Zealand sports settings," *Health Promotion International*, vol. 34, pp. 803-810, 2019.

- [94] E. de Leeuw, "Engagement of sectors other than health in integrated health governance, policy, and action," *Annual Review of Public Health*, vol. 38, pp. 329-49, 2017.
- [95] E. De Marchi, S. Pigliafreddo, A. Banterle, M. Parolini and A. Cavaliere, "Plastic packaging goes sustainable: An analysis of consumer preferences for plastic water bottles," *Environmental Science and Policy*, vol. 114, pp. 305-311, 2020.
- [96] X. Ma, C. Park and J. Moultrie, "Factors for eliminating plastic in packaging: The European FMCG experts' view," *Journal of Cleaner Production*, vol. 256, 2020.
- [97] M. Stoica, V. M. Antohi, M. L. Zlati and D. Stoica, "The financial impact of replacing plastic packaging by biodegradable biopolymers - A smart solution for the food industry," *Journal of Cleaner Production*, vol. 277, 2020.
- [98] D. L. Olstad, J. Vermeer, L. J. McCargar and R. J. Prowse, "Using traffic light labels to improve food selection in recreation and sport facility eating environments," *Appetite*, vol. 91, pp. 329-335, 2015.
- [99] J.-L. D. McIsaac, S. Jarvis, R. Spencer and S. Kirk, "'A tough sell': Findings from a qualitative analysis on the provision of healthy foods in recreation and sport settings," *Health Promotion and Chronic Disease Prevention in Canada*, vol. 38, no. 1, pp. 18-22, 2018.
- [100] C. A. Roberto, "How psychological insights can inform food policies to address unhealthy eating habits," *American Psychologist*, vol. 75, no. 2, pp. 265-273, 2020.
- [101] M. S. Caswell and R. M. Hanning, "Adolescent perspectives of the recreational ice hockey environment and influences on eating behaviour revealed through photovoice," *Public Health Nutrition*, vol. 21, no. 7, pp. 1255-1265, 2018.
- [102] K. Glanz, B. K. Rimer and K. Viswanath, Eds., *Health Behavior and Health Education*, Fourth Edition ed., San Francisco, CA: John Wiley & Sons, Inc., 2008.
- [103] Public Health Ontario, "Healthy Kids Community Challenge (HKCC)," 2021. [Online]. Available: www.publichealthontario.ca/en/health-topics/health-promotion/child-youth-health/hkcc. [Accessed 2020].
- [104] Ontario Food and Nutrition Strategy Group, "Ontario food and nutrition strategy: A comprehensive evidence informed plan for healthy food and food systems in Ontario," 2017. [Online]. Available: https://sustainontario.com/work/ofns/wp-content/uploads/sites/6/2017/07/Ontario_Food_and_Nutrition_Strategy_Report.pdf.
- [105] M. Nanney, R. F. MacLehose, M. Y. Kubik, C. S. Davey, M. J. O'Connell, K. Y. Grannon and T. F. Nelson, "School obesity prevention policies and practices in Minnesota and student outcomes," *American Journal of Preventive Medicine*, vol. 51, no. 5, pp. 656-663, 2016.

- [106] S. Green, K. Glanz and J. Bromberg, "Facilitators and barriers to developing, implementing, and evaluating healthy vending policies in four cities," *Health Promotion Practice*, vol. 22, no. 5, pp. 670-675, 2020.
- [107] A. Rosi, C. Zerbin, N. Pellegrini, F. Scazzina, F. Brighenti and G. Lugli, "How to improve food choices through vending machines: The importance of healthy food availability and consumers' awareness," *Food Quality and Preference*, vol. 62, pp. 262-269, 2017.
- [108] Victoria Department of Health, "Municipal Health and Wellbeing Planning," 2 August 2022. [Online]. Available: <https://www.health.vic.gov.au/health-strategies/increasing-healthy-eating>. [Accessed 10 March 2023].
- [109] J. A. Durlak and E. P. DuPre, "Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation," *American Journal of Community Psychology*, vol. 41, pp. 327-350, 2008.
- [110] J. Leeman, L. Calancie, M. A. Hartman, C. T. Escoffery, A. K. Herrmann, L. E. Tague, A. A. Moore, K. M. Wilson, M. Schreiner and C. Samuel-Hodge, "What strategies are used to build practitioners' capacity to implement community-based interventions and are they effective?: A systematic review," *Implementation Science*, vol. 10, no. 80, 2015.
- [111] J. Leeman, L. Calancie, M. C. Kegler, C. T. Escoffery, A. K. Herrman, E. Thatcher, M. Hartman and M. Fernandez, "Developing theory to guide building practitioners' capacity to implement evidence-based interventions," *Health Education & Behavior*, vol. 44, no. 1, pp. 59-69, 2017.
- [112] K. DeCorby-Watson, G. Mensah, K. Bergeron, S. Abdi, B. Rempel and H. Manson, "Effectiveness of capacity building interventions relevant to public health practice: A systematic review," *BMC Public Health*, vol. 18, no. 684, 2018.
- [113] J. Leeman, S. A. Birken, B. J. Powell, C. Rohweder and C. M. Shea, "Beyond "implementation strategies": Classifying the full range of strategies used in implementation science and practice," *Implementation Science*, vol. 12, no. 125, 2017.
- [114] C. R. May, M. Johnson and T. Finch, "Implementation, context and complexity," *Implementation Science*, vol. 11, p. 12, 2016.
- [115] E. W. Ford, W. J. Duncan and P. M. Ginter, "Health departments' implementation of public health's core functions: an assessment of health impacts," *Public Health*, vol. 119, no. 1, pp. 11-21, 2005.
- [116] R. K. Yin, *Case Study Research and Applications Design and Methods*, Thousand Oaks, California: Sage Publications Inc., 2018.
- [117] R. E. Stake, *Multiple Case Study Analysis*, New York, New York: The Guilford Press, 2006.

- [118] M. B. Miles, A. M. Huberman and J. Saldana, *Qualitative Data Analysis A Methods Sourcebook*, Thousand Oaks, CA: Sage Publications Ltd., 2020.
- [119] B. Rihoux, I. Rezsohazy and D. Bol, "Qualitative Comparative Analysis (QCA) in public policy analysis: An extensive review," *German Policy Studies*, vol. 7, no. 3, pp. 9-82, 2011.
- [120] L. Cronqvist, *Tosmana [Version 1.61]*, University of Trier, 2019.
- [121] I. Rohlfing, "The choice between Crips and Fuzzy sets in Qualitative Comparative Analysis and the ambiguous consequences for finding consistent set relations," *Field Methods*, vol. 32, no. 1, pp. 75-88, 2020.
- [122] C. C. Ragin, D. Shulman, A. Weinberg and B. Gran, "Complexity, generality, and qualitative comparative analysis," *Field Methods*, vol. 15, p. 323340, 2003.
- [123] T. Blackman, J. Wistow and D. Byrne, "Using Qualitative Comparative Analysis to understand complex policy problems," *Evaluation*, vol. 19, no. 2, pp. 126-140, 2013.
- [124] IBM Corporation, *IBM SPSS Statistics for Windows, Version 27.0*, Armonk: IBM Corp, 2020.
- [125] F. Faul, A. Buchner and A. G. Lang, "Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses," *Behavior Research Methods*, vol. 41, no. 4, pp. 1149-1160, 2009.
- [126] J. M. Riveros Gavilanes, "Low sample size and regression: a Monte Carlo approach," *Journal of Applied Economic Sciences*, vol. XV, no. (1)67, pp. 22-44, 2020.
- [127] T. Haesebrouck, "The added value of Multi-value Qualitative Comparative Analysis," *Forum: Qualitative Social Research*, vol. 17, no. 1, p. Art.12, 2016.
- [128] A. Thiem, "Clearly crisp and not fuzzy: A reassessment of the (putative) pitfalls of multi-value QCA," *Field Methods*, vol. 25, no. 2, pp. 197-207, 2013.
- [129] G. J. Hollands, I. Shemilt, T. M. Marteau, S. A. Jebb, M. P. Kelly, R. Nakamura, M. Suhrcke and D. Ogilvie, "Altering micro-environments to change populaton health behaviour: towards an evidence base for choice architecture interventions," *BMC Public Health*, vol. 13, no. 1218, 2013.
- [130] P. G. Hansen, L. R. Skov and K. L. Skov, "Making healthy choices easier: Regulation versus nudging," *Annual Review of Public Health*, vol. 37, pp. 237-51, 2016.
- [131] T. Bucher, C. Collins, M. E. Rollo, T. A. McCaffrey, N. De Vlieger, D. Van der Bend, H. Truby and F. J. Perez-Cueto, "Nudging comsumers towards healthier choices: A systematic review of positional influences on food choice," *British Journal of Nutrition*, vol. 115, pp. 2252-2263, 2016.
- [132] A. Forsyth, M. Nicholson, A. Skiadopoulos, G. Trakman, B. Devlin, R. Belski, E. Randle, P. O'Halloran, M. Cameron and K. Staley, "Interventions to reduce sugar-sweetened beverage

- consumption using a nudge approach in Victorian community sports settings," *Australian and New Zealand Journal of Public Health*, vol. 45, no. 6, pp. 592-598, 2021.
- [133] M. van Rookhuijzen and E. de Vet, "Nudging healthy eating in Dutch sports canteens: A multi-method case study," *Public Health Nutrition*, vol. 24, no. 2, pp. 327-337, 2020.
- [134] J. P. Reynolds, S. Archer, M. Pilling, M. Kenny, G. J. Hollands and T. M. Marteau, "Public acceptability of nudging and taxing to reduce consumption of alcohol, tobacco, and food: A population-based survey experiment," *Social Science & Medicine*, vol. 236, 2019.
- [135] J.-L. D. Mclsaac, R. Spencer, K. Chiasson, J. Kontak and S. F. Kirk, "Factors influencing the implementation of nutrition policies in schools: A scoping review," *Health Education & Behavior*, vol. 46, no. 2, pp. 224-250, 2019.
- [136] E. Rosewarne, W.-K. Chislett, B. McKenzie, C. N. Mhurchu, T. Boelsen-Robinson, M. Blake and J. Webster, "Understanding enablers and barriers to the implementation of nutrition standards in publicly funded institutions in Victoria," *Nutrients*, vol. 14, no. 13, p. 2628, 2022.
- [137] A. Carrad, A.-M. Parrish and H. Yeatman, "Building public health capacity through organizational change in sport system: A multiple-case study within Australian gymnastics," *International Journal of Environmental Research and Public Health*, vol. 18, no. 13, p. 6726, 2021.
- [138] C. Lane, P.-J. Naylor, A. Shoesmith, L. Wolfenden, A. Hall, R. Sutherland and N. Nathan, "Identifying essential implementation strategies: A mixed methods process evaluation of a multi-strategy policy implementation intervention for schools," *International Journal of Behavioral Nutrition and Physical Activity*, vol. 19, no. 44, 2022.
- [139] L. Wolfenden, K. Reilly, M. Kingsland, A. Grady, C. M. Williams, N. Nathan, R. Sutherland, J. Wiggers, J. Jones, R. Hodder, M. Finch, T. McFadyen, A. Bauman, C. Rissel, A. Milat, T. Swindle and S. L. Yoong, "Identifying opportunities to develop the science of implementation for community-based non-communicable disease prevention: A review of implementation trials," *Preventive Medicine*, vol. 118, pp. 279-285, 2019.
- [140] R. Mosson, H. Augustsson, A. Back, M. Ahstrom, U. von Theile Schwarz, A. Richter, M. Gunnarsson and H. Hasson, "Building implementation capacity (BIC): A longitudinal mixed methods evaluation of a team intervention," *BMC Health Services Research*, vol. 19, no. 287, 2019.
- [141] B. Nguyen, L. Cranney, B. Bellow and M. Thomas, "Implementing food environment policies at scale: What helps? What hinders? A systematic review of barriers and enablers," *International Journal of Environmental Research and Public Health*, vol. 18, no. 10346, 2021.
- [142] L. Wolfenden, M. Finch, N. Nathan, N. Weaver, J. Wiggers, S. L. Yoong, J. Jones, P. Dodds, R. Wyse, R. Sutherland and K. Gillham, "Factors associated with early childhood education and care service implementation of healthy eating and physical activity policies in Australia: A cross-sectional study," *Translational Behavioral Medicine Practice, Policy, Research*, vol. 5, no. 3, pp. 327-334, 2015.

- [143] D. Riesenbergr, M. R. Blake, T. Boelsen-Robinson, A. Peeters and A. J. Cameron, "Policies influencing the provision of healthy food and drinks in local government-owned sport and recreation facilities in Victoria, Australia," *Australian and New Zealand Journal of Public Health*, vol. 44, no. 3, pp. 240-244, 2020.
- [144] K. L. Reilly, N. Nathan, J. Wiggers, S. L. Yoong and L. Wolfenden, "Scale up of a multi-strategic intervention to increase implementation of a school healthy canteen policy: Finding of an intervention trial," *BMC Public Health*, vol. 18, p. 10, 2018.
- [145] C. Lane, P.-J. Naylor, D. Tomlin, S. Kirk, R. Hanning, L. Masse, D. L. Olstad, R. Prowse, S. Caswell, S. Jarvis, T. Milford and K. Raine, "Healthy vending contracts: Do localized policy approaches improve the nutrition environment in publicly funded recreation and sport facilities?," *Preventive Medicine Reports*, vol. 16, 2019.
- [146] M. Rosin, S. Mackay, S. Gerritsen, L. Te Morenga, G. Terry and C. N. Mhurchu, "Barriers and facilitators to implementation of healthy food and drink policies in public sector work places: A systematic literature review," *Nutrition Reviews*, vol. 82, no. 4, pp. 503-535, 2023.
- [147] J. Dancey, B. Reeve, A. Jones and J. Brinblecombe, "The use of contracts to implement and manage healthy vending: Best practice recommendations for effective and sustained interventions," *BMC Public Health*, vol. 24, no. 3219, 2024.
- [148] M. M. Vine, J. Vermeer, L. Romano, D. W. Harrington, A. E. Butler, K. A. Patte, K. M. Godin and S. T. Leatherdale, "Secondary school nutrition policy compliance in Ontario and Alberta, Canada: A follow-up study examining vending machine data from the COMPASS Study," *International Journal of Environmental Research and Public Health*, vol. 18, no. 3817, 2021.
- [149] L. J. Damschroder, D. C. Aron, R. E. Keith, S. R. Kirsh, J. A. Alexander and J. C. Lowery, "Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science," *Implementation Science*, vol. 4, no. 50, 2009.
- [150] M. A. Kirk, C. Kelley, N. Yankey, S. A. Birken, B. Abadie and L. Damschroder, "A systematic review of the use of the Consolidated Framework for Implementation Research," *Implementation Science*, vol. 11, no. 72, 2016.
- [151] S. Cassar, J. Salmon, A. Timperio, P.-J. Naylor, F. van Nassau, A. M. Contardo Ayala and H. Koorts, "Adoption, implementation and sustainability of school-based physical activity and sedentary behaviour interventions in real-world settings: A systematic review," *International Journal of Behavioral Nutrition and Physical Activity*, vol. 16, no. 120, 2019.
- [152] B. S. Meshkovska, A. niel, J. Wendt, H. Jilani, M. Scheidmeir, J. M. Stratil, N. Lien and on behalf of the PEN Consortium, "Barriers and facilitators to implementation of direct fruit and vegetables provision interventions in kindergartens and schools: A qualitative systematic review applying the consolidated framework for implementation research (CFIR)," *International Journal of Behavioral Nutrition and Physical Activity*, vol. 19, no. 11, 2022.

- [153] L. Vanderlee, M. M. Vine, N. E. Fenton and D. Hammond, "Stakeholder perspectives on implementing menu labeling in a cafeteria setting," *American Journal of Health Behavior*, vol. 40, no. 3, pp. 371-80, 2016.
- [154] K. Lobczowska, A. Banik, K. Brukalo, S. Forberger, T. Kubiak, P. Romaniuk, M. Scheidmeir, D. A. Scheller, J. M. Steinacker, J. Wendt, K. Wieczorowska-Tobis, M. P. Bekker, H. Zeeb and A. Luszczynska, "Meta-review of implementation determinants for policies promoting healthy diet and physically active lifestyle: Application of the Consolidated Framework for Implementation Research," *Implementation Science*, vol. 17, no. 2, 2022.
- [155] G. M. McLoughlin, P. Candal, S. Vazou, J. A. Lee, D. A. Dzewaltowski, R. R. Rosenkranz, L. Lanningham-Foster, D. A. Gentile, L. Liechty, S. Chen and G. J. Welk, "Evaluating the implementation of the SWITCH school wellness intervention and capacity-building process through multiple methods," *International Journal of Behavioral Nutrition and Physical Activity*, vol. 17, no. 162, 2020.
- [156] H. P. Sobers, L. Bishop, S. W. Ng, S. Soates-Wynter, N. S. Greaves and M. M. Murphy, "Understanding the need for a whole-of-society approach in school nutrition policy implementation: A qualitative analysis," *Implementation Science Communications*, vol. 2, no. 79, 2021.
- [157] P. Nilsen, "Making sense of implementation theories, models and frameworks," *Implementation Science*, vol. 10, p. 53, 2015.
- [158] J. W. Creswell and J. D. Creswell, *Research Design Qualitative, Quantitative, and Mixed Methods Approaches*, 5th ed., Thousand Oaks, California: Sage Publications, Inc., 2018.
- [159] HealthLinkBC, "Brand Name Food List," [Online]. Available: <https://bnfl.healthlinkbc.ca/>. [Accessed 30 June 2022].
- [160] M. M. Vine and S. J. Elliot, "Examining local-level factors shaping school nutrition policy implementation in Ontario, Canada," *Public Health Nutrition*, vol. 17, no. 6, pp. 1290-1298, 2013.
- [161] S. Caswell, P.-J. Naylor, D. Olstad, S. Kirk, L. Masse, K. Raine and R. Hanning, "Recreation facility food and beverage environments in Ontario, Canada: An appeal for policy," *International Journal of Environmental Research and Public Health*, vol. 18, no. 8174, 2021.
- [162] R. Pechey, O. Sexton, S. Codling and T. M. Marteau, "Impact of increasing availability of healthier vs. less-healthy food on food selection: A randomized laboratory experiment," *BMC Public Health*, vol. 21, no. 132, 2021.
- [163] C. E. Evans, S. Worth, R. White and E. K. Strachan, "Evaluation of an experiment to increase availability of healthier snack foods in vending machines situated within English sports facilities," *Public Health Nutrition*, vol. 26, no. 12, pp. 3088-3099, 2023.

- [164] A. C. Jones, S. Kirkpatrick and D. Hammond, "Beverage consumption and energy intake among Canadians: Analysis of 2004 and 2015 national dietary intake data," *Nutrition Journal*, vol. 18, no. 60, 2019.
- [165] T. Boelsen-Robinson, A. Jerebine, A. Kurzeme, B. Gilham, O. T. Huse, M. R. Blake, K. Backholer, A. Chung and A. Peeters, "Evaluating the implementation and customer acceptability of a sugar-sweetened beverage reduction initiative in thirty Australian aquatic and recreation centres," *Public Health Nutrition*, vol. 24, no. 15, pp. 5166-5175, 2021.
- [166] T. Boelsen-Robinson, M. R. Blake, A. D. Brown, O. Huse, C. Palermo, N. A. George and A. Peeters, "Mapping factors associated with a successful shift towards healthier food retail in community-based organizations: A systems approach," *Food Policy*, vol. 101, 2021.
- [167] T. Boelsen-Robinson, M. R. Blake, K. Backholer, J. Hettiarachchi, C. Palermo and A. Peeters, "Implementing healthy food policies in health services: A qualitative study," *Nutrition & Dietetics*, vol. 76, pp. 336-43, 2019.
- [168] O. Huse, L. Orelana, M. Ferguson, C. Palermo, A. Jerebine, C. Zorbas, T. Boelson-Robinson, M. R. Blake, A. Peeters, J. Brimblecombe, M. Moodie and K. Backholer, "Retailer-led healthy pricing interventions: A pilot study within aquatic and recreation centres in Victoria Australia," *Health Promotion International*, vol. 36, pp. 430-448, 2021.
- [169] S. Johnson, A. Van Hove, A. Donaldson, F. Lemonnier, F. Rostan and A. Vuillemin, "Building health-promoting sports clubs: A participative concept mapping approach," *Public Health*, vol. 188, pp. 8-17, 2020.
- [170] P. Nilsen and S. Bernhardsson, "Context matters in implementation science: A scoping review of determinant frameworks that describe contextual determinants for implementation outcomes," *Health Services Research*, vol. 19, 2019.
- [171] D. Yach, M. McKee, A. D. Lopez and T. Novotny, "Improving diet and physical activity: 12 lessons from controlling tobacco smoking," *BMJ*, vol. 330, pp. 898-900, 2005.
- [172] J. Leeman, A. E. Myers, K. M. Ribisl and A. S. Ammerman, "Disseminating policy and environmental change interventions: Insights from obesity prevention and tobacco control," *International Journal of Behavior Modification*, vol. 22, pp. 301-311, 2015.
- [173] M. Smith, L. Signal, R. Edwards and J. Hoek, "Children's and parents' opinions on the sport-related food environment: A systematic review," *Obesity Reviews*, vol. 18, pp. 1018-1039, 2017.
- [174] J. A. Dimmock, A. L. Thornton, J. C. Nicholas, G. G. Ho, F. niel, K. J. Guelfi and B. Jackson, "'They deserve a treat': The nature and antecedents of parental licensing surrounding children's physical activity," *Public Health Nutrition*, vol. 24, no. 8, pp. 2098-2108, 2020.

- [175] S. Elliot, S. Velardo, M. Drummond and C. Drummond, "Sport and children's nutrition: What can we learn from the junior Australian football setting?," *Aisa-Pacific Journal of Health, Sport and Physical Education*, vol. 7, no. 1, pp. 91-104, 2016.
- [176] T. Orava, S. Manske and R. Hanning, "Beverages and snacks available in vending machines from a subset of Ontario secondary schools: Do offerings align with provincial nutrition standards?," *Canadian Journal of Public Health*, vol. 107, no. 4-5, pp. e417-e423, 2016.
- [177] K. M. Godin, D. Hammond, S. Chaurasia and S. T. Leatherdale, "Examining changes in school vending machine beverage availability and sugar-sweetened beverage intake among Canadian adolescents participating in the COMPASS study: a longitudinal assessment of provincial school nutrition policy compliance and effectiveness," *Journal of Behavioral Nutrition and Physical Activity*, vol. 18, no. 121, 2018.
- [178] J. F. Sallis, "Needs and challenges related to multilevel interventions: Physical activity examples," *Health Education & Behavior*, vol. 45, no. 5, pp. 661-7, 2018.
- [179] R. Pechey, E. Cartwright, M. Pilling, G. J. Hollands, M. Vasiljevic, S. A. Jebb and T. M. Marteau, "Impact of increasing the proportion of healthier foods available on energy purchased in worksite cafeterias: A stepped wedge randomized controlled pilot trial," *Appetite*, vol. 133, pp. 286-296, 2019.
- [180] M. R. Blake, T. Boelsen-Robinson, L. Hanna, A. Ryan and A. Peeters, "Implementing a healthy food retail policy: A mixed-methods investigation of change in stakeholders' perspectives over time," *Public Health Nutrition*, vol. 24, no. 9, pp. 2669-2680, 2020.
- [181] N. Bennion, L. A. Spruance and J. E. Maddock, "Do youth consume more calories than they expend in youth sports leagues? An observational study of physical activity, snacks, and beverages," *American Journal of Health Behavior*, vol. 44, no. 2, pp. 180-187, 2020.
- [182] K. M. Godin, A. Chaurasia, D. Hammond and S. T. Leatherdale, "Examining associations between school food environment characteristics and sugar-sweetened beverage consumption among Canadian secondary-school students in the COMPASS study," *Public Health Nutrition*, vol. 21, no. 14, pp. 1928-1940, 2018.
- [183] D. A. Cohen and L. I. Lesser, "Obesity prevention at point of purchase," *Obesity Reviews*, vol. 17, no. 5, pp. 389-396, 2016.
- [184] Alberta Health Services, "Healthy Food Checker," [Online]. Available: www.albertahealthservices.ca/nutrition.
- [185] X. Li, A. Yin, H. Young Choi, V. Chan, M. Allman-Farinelle and J. Chen, "Evaluating the quality and comparative validity of manual food logging and artificial intelligence-enabled food image recognition in apps for nutrition care," *Nutrients*, vol. 16, 2024.
- [186] E. R. Ziraldo, H. Jeong, A. Blais, M. Ahmed, M. Uji, Y. Yang, V. S. Malik, D. W. Sellen and M. R. L'Abbe, "Grocery and chain restaurant foods and beverages allowed for sale in Ontario schools:

An evaluation against Ontario's School Food and Beverage Policy," *Applied Physiology, Nutrition, and Metabolism*, vol. 50, pp. 1-11, 2025.

- [187] E. K. Proctor, E. Toker, R. Tabak, V. R. McKay, C. Hooley and B. Evanoff, "Market viability: A neglected concept in implementation science," *Implementation Science*, vol. 16, no. 98, 2021.
- [188] World Health Organization, "The Helsinki statement on health in all policies," *Health Promotion International*, vol. 29, no. S1, pp. i17-i18, 2013.
- [189] World Health Organization, "Health in all policies (HiAp) framework for country action," *Health Promotion International*, vol. 29, no. S1, pp. i19-i28, 2013.

APPENDIX A: FACILITY-LEVEL POLICY ASSESSMENT

FACILITY REPRESENTATIVE ASSESSMENT QUESTIONS

1. Is cafeteria publicly operated/funded?
2. Is cafeteria privately operated/funded?
3. Is cafeteria run by volunteers?
4. Is snack bar publicly operated/funded?
5. Is snack bar privately operated/funded?
6. Is snack bar run by volunteers?
7. Are vending snack machines publicly operated/funded?
8. Are vending snack machines privately operated/funded?
9. Are vending snack machines run by volunteers?
10. Are vending beverage machines publicly operated/funded?
11. Are vending beverage machines privately operated/funded?
12. Are vending beverage machines run by volunteers?
13. Is fundraising publicly operated/funded?
14. Is fundraising privately operated/funded?
15. Is fundraising run by volunteers?

EPL SCORING GUIDELINES

The following is taken from the guideline document used to score facility-level policy. Please note only information relevant to scoring has been included.

Overview and Scope

This policy assessment is directly focused on foods sold or provided. Other policies are included in scoring or considered only as they relate to creating a positive food environment and supportive context for food sales.

1. If a facility has more than one policy that applies specifically to food and beverages (for instance a marketing policy and a vending policy) then both are examined to score facility level policy. In the example case above, a marketing policy, which affects the food environment, would influence the comprehensiveness score only. Our purpose is not to score the marketing policy per se in terms of specificity or monitoring. Any issues of Scope will be dealt with through discussion with the Investigators.
2. Food safety and allergen policies are important health policies but are outside the scope of this assessment that is addressing the health quality of food and beverages in terms of composition. We will collect information about food safety & allergen policies as descriptors only.

3. Only the documents provided can be used for scoring. If an individual has additional information that is not included in the provided documents, it must not be considered. For example, if they have a different summary of provincial guidelines or an additional explanation of the provincial guidelines, these are **not** to be used. If information is missing from the information we provide for the scoring, the National Coordinator needs to be contacted.

4. When referring to the Stringency of the Policy we have used terms from the NS Guidelines (Maximum, Moderate, Minimum) because we had to choose one and all provinces use different terminology. Our intent is that the NS terms stand in for the equivalent terms used in other provinces as follows:

NS	AB	BC (current)	BC (pre-2008)
Minimum (Min)	Choose Least Often	Do Not Sell	Choose Least / Not Recommended
Moderate (Mod)	Choose Sometimes	Sell Sometimes	Choose Sometimes
Maximum (Max)	Choose Most Often	Sell Most	Choose Most

Scoring sheet for facility-level policy

Facility ID#:	Score
Policy type Is there a policy that governs the health quality of the food in the facility? Scoring: 0 = no policy 0.5 = a vague / generic policy or statement on both or either packaged or prepared food/beverages 1 = policy is a recommendation and covers packaged <u>or</u> prepared 2 = policy is a recommendation and covers both packaged and prepared 2.5 = policy is mixed: part is required and part is recommended and covers some combination packaged <u>and/or</u> prepared 3 = policy is a requirement and covers both packaged <u>or</u> prepared 4 = policy is a requirement and covers both packaged <u>and</u> prepared	
Specificity of the policy Does the policy describe the health quality of food/beverages specifically? Scoring: 0 = no mention of healthy food provision 1 = general (offer “healthy” foods) 2 = state specific criteria (e.g., 50% max, 50% mod or the policy specifically refers to Provincial criteria)	
Stringency of policy (based on the proportion of each category but is NOT the stringency of the categories themselves) Step 1. From the policy, determine the percentage of recommended/required healthy (%MOD + MAX) food and put in the % MOD+MAX Food column. Step 2. From the policy, determine the percentage of recommended/ required healthy (%MOD + MAX) beverages and put in the % MOD+MAX Bev	

column. If food and beverages are dealt with together in the policy document, use the same percentage in each column. If no percentage is stated in the policy, enter 0 Special case - a phased in policy. If the policy is phased in over time, use the average of the percentages from the current date and any future dates to complete steps 1 and 2 above. For example if the policy says to have at least 50% MOD and at least 20% MAX for food and beverages in 2017 but by 2019 there should be 100% MAX', enter 85% for % MOD+MAX Food and 85% for % MOD+MAX Bev Special case - policy has different recommendation/ requirement for packaged vs prepared, food vs beverage etc. use the average for food and the average for beverage. For example, if at least 60% of the food/beverages in the concession must be 'healthy' but for vending, 80% of snacks and 50% of beverages must be 'healthy', use 70% for food and 55% for beverages.	
Step 3. Create a sub-score. Multiply the % MOD+MAX Food by 2 and the % MOD+MAX Bev by 2. Step 4. Add the food and beverage sub-scores from step 3 to get the Final Stringency Score (out of 4)	
Monitoring	
Is monitoring of policy implementation addressed in the policy? (Look for wording like monitoring, monitoring implementation, investigate, evaluate, etc.)	
Scoring:	
0 = no	
1 = mentions monitoring	
2 = describes who is responsible for monitoring (e.g., Committee oversight) OR describe the measurement process and cycle	
3 = describes who is responsible for monitoring (e.g., Committee oversight) AND describe the measurement process and cycle	
Comprehensiveness	
Does the policy address other areas of the food environment that influence purchasing and/or the overall culture of the organization?	
- 3rd party fundraising - special events - marketing - staff eating environment - food security (access to enough healthy food for a healthy life) - eating environment - education to the public and/or staff - non-food incentives/ prizes for programs/events	
Scoring:	
0 = no components	
1 = 1 component	
2 = 2 or 3 components	
3 = 4 or 5 components	
4 = 6 or more components	
Total score (Add Policy Type + Specificity + Stringency + Monitoring + Comprehensive for a score out of 17)	

APPENDIX B: FACILITY CONTEXT DATA SUMMARY

Table B.1: Facility context summary guide

Control/Guideline/CBI	Baseline	Follow-up
Facility: Name		
Address		
Phone number		
Amenities	Include details re seasonality	
Vending provider		
# Vending machines	Breakdown by type of machine (i.e., beverage, snack, hot)	
Vending notes		
Concession provider		
Concession notes		
Audit date		
Audit notes		
Initial facility contact		
Current facility contact		
Other notes		

APPENDIX C: EPL CAPACITY BUILDING INTERVENTION

The table below is taken from the EPL study protocol as also used in Olstad et al. [4]

Table C.1: EPL capacity building intervention

CBI Resources & Supports	Description	Frequency
Province-specific training	Half-day in-person group training led by provincial coordinator • Five-step change process (<i>see steps below</i>) • Operational areas for policy and program changes in recreation food environments ○ Practical examples provided for each operational area • Provincial nutrition guidelines • Overview available resources • CBI protocol and timeline	Once
Baseline Evaluation Report	Facilities were provided a report summarizing baseline food environment quality and facility capacity	Once
Online Toolkit	Website: BC Recreation and Parks Association www.stayactiveeathealthy.ca • Searchable database of resources and provincial pages with local resources • Information for recreation facilities, industry and consumers on healthy food in recreation	Unlimited access
Online Resources	Additional local resource hubs to support environment and policy change were provided: British Columbia: https://bnfl.healthlinkbc.ca/ Alberta: www.healthyeatingstartshere.ca ; www.apccprecproject.com Nova Scotia: https://thrive.novascotia.ca/ , http://www.recreationns.ns.ca/guidelines-for-healthy-eating-in-recreation-and-sport-settings/	Unlimited access
Provincial Coordinator Support	On-demand support, resources and individual training (i.e., assistance with nutrition analysis, product sourcing, finding/generating resources, connecting with community resources, etc.)	Monthly and as needed
Seed funds	\$1000 for each CBI facility to support intervention plans as determined by the facility	Once
Electronic Information Blitzes	Informative emails from provincial coordinators addressing common inquiries, challenges, and successes	Every 1-2 months
Provincial Teleconferences	60 minute intra-provincial cross-facility meetings • Facilities presented current and planned activities, challenges and facilitators • Included facility representatives, researchers, and provincial coordinator	Every 3 months
Facility Action Plan	CBI facilities developed implementation plans to achieve their food environment, guideline, and facility-level policy goals	Baseline and every 6 months

Key facility level steps for CBI

1. Facility manager or designated representative participate in province-specific training session
2. Form a facility planning team
3. Planning team review baseline facility evaluation report
4. Develop an individualized facility action plan
5. Implement, monitor and adjust action plan

APPENDIX D: INTERVIEW GUIDE

FACILITIES RANDOMIZED TO CBI

Mid-intervention Interview

1. For the past few months/year/couple of years, you have been attempting to change the food environment in your facility. Can you describe your progress to date? Probe: what has gone on in your facility?
2. What were the key challenges you have had to face as you began to approach the issue of environmental and policy changes in your facility? Probe: were there any barriers to making changes?
3. What were the key factors that helped you proceed? Probe: what helped you make changes?
4. What changes have you observed since participating in Eat, Play, Live?
5. Can you describe how you used the resources provided through the Eat, Play, Live initiative in the process? Probe: funding, resource toolkit, marketing materials, website, etc.
6. Did you use any of the Stay Active Eat Healthy tool kit or promotional and marketing materials provided by Eat, Play, Live?
7. What are your plans for the next 3-6 months? Probe: what are your next steps?
8. What other supports do you need to have in place to support your progress?
9. Is there anything else you would like to add that I have missed?
10. Would you be willing to have your community featured as a success story on the Stay Active Eat Healthy website?

Follow-up Interview

1. For the past 18 months, you have been attempting to change the food environment in your facility. Can you describe your progress to date?
2. What were the key challenges you have had to face as you began to approach the issue of environmental and policy changes in your facility?
3. What were the key factors that helped you proceed?
4. What changes have you observed since participating in Eat Play Live?
5. Can you describe how you used the resources provided through the Eat Play Live initiative in the process?
6. Did you use any of the Stay Active Eat Healthy tool kit or promotional and marketing materials provided by Eat Play Live?
7. What are your plans for the next 3-6 months?
8. What other supports do you need to have in place to support your progress?
9. Is there anything else you would like to add that I have missed?
10. Would you be willing to have your community featured as a success story on the Stay Active Eat Healthy Site?

NON-INTERVENTION FACILITIES

1. How would you describe your food environment?
2. Has your food environment changed over the past 18 months? If so, in what way has it changed?
3. If there has been a change . . .
 - a. What were the key challenges you have had to face as you began to approach the issue of environmental and policy changes in your facility?
 - b. What were the key factors that helped you proceed?
 - c. Can you describe any resources that have been used in the change process?
 - d. What are your plans for the next 3-6 months?
 - e. What other supports do you need to have in place to support your progress?
 - f. Is there anything else you would like to add that I have missed?

If there has been no change . . .

- a. What barriers exist in terms of offering healthy choices?
- b. What are your plans for the next 3-6 months in terms of healthy food and beverage sales policies and issues?
- c. What supports would you need to have in place to support bringing your food environment in line with the provincial guidelines?
- d. Is there anything else you would like to add that I have missed?

APPENDIX E: CROSS-CASE ANALYSIS TEAM RATINGS/SCORING

Table E.1: Cross-case analysis rating grid

Rating	Context	Mobilization	Baseline facility-level policy	Follow-up facility-level policy
Low	Lots of barriers Few facilitators	Few goals Few activities Low engagement	No Policy or no contract	No Policy or no contract
Low-moderate	Quite a few barriers but some facilitators	Some goals Some activities Low engagement	Policy or contract, but it is weak (does not refer to health)	Policy or contract, but it is weak (does not refer to health)
Moderate	Quite a few facilitators but equal number (or equal power) of barriers	Some or many goals Some activities At least moderate engagement	Policy or contract with strength in 1 (refers to health) OR 2 weak contracts	Policy or contract with strength in 1 (refers to health) OR 2 weak contracts
Moderate-High	Quite a few facilitators but some barriers	Some or many goals Some or many activities but activities are not as deep as high impact activities Moderate-high level of engagement	Policy and contracts for some, combination of 1 strong and other(s) weak May not have contract for all providers	Policy and contracts for some, combination of 1 strong and other(s) weak May not have contract for all providers
High	Many facilitators Very few barriers	Some or many goals Numerous activities (some or most are high impact activities) Highly engaged	Strong policy and contracts for all or most contracts (if multiple) Majority must be strong	Strong policy and contracts for all or most contracts (if multiple) Majority must be strong

Table E.2: Rating to score conversion legend

Rating		Numerical Score
Low	L	1
Low-Moderate	LM	2
Moderate	M	3
Moderate -High	MH	4
High	H	5

APPENDIX F: STUDY 3 ANALYSIS SUMMARY

Table F.1: Analysis of nutrition guidelines implementation process between More Successful (MS) and Less Successful (LS) facilities as guided by the Consolidated Framework for Implementation Research (CFIR) [1]

Construct	Distinguishing	Theme/Factor	Sub-theme/Sub-factor	Additional Explanation/Comments
I. INNOVATION DOMAIN				Innovation: provincial nutrition guidelines for recreation and sport facilities
A. Innovation Source	No	No themes or factors emerged		
B. Innovation Evidence Base	No	No themes or factors emerged		
C. Innovation Relative Advantage	No	No themes or factors emerged		
D. Innovation Adaptability	No	No themes or factors emerged		
E. Innovation Trialability	No	No themes or factors emerged		
F. Innovation Complexity	No	Navigating nutrition guideline complexity	Negotiating multiple operational areas	
			Translating/operationalizing guidelines	e.g., defining “healthier” choices
G. Innovation Design	No	No themes or factors emerged		
H. Innovation Cost	Yes	Accommodating financial concerns		Belief that healthier options not financially viable a greater barrier for LS facilities
II. OUTER SETTING DOMAIN				Province and municipalities
A. Critical Incidents	N/A			No large-scale or unanticipated events disrupted guideline implementation or the Capacity Building Intervention (CBI)
B. Local Attitudes	No	No themes or factors emerged		
C. Local Conditions	No	No themes or factors emerged		
D. Partnerships & Connections	Yes	Building and leveraging partnership with Public Health unit Dietitian (PH RD)		e.g., MS facilities stronger partnerships and more utilization of programming & support from PH RD
E. Policies & Laws	No	No themes or factors emerged		
F. Financing	No	No themes or factors emerged		
G. External Pressure	No	No themes or factors emerged		Includes Societal, Market and Performance Measurement sub-constructs

Construct	Distinguishing	Theme/Factor	Sub-theme/Sub-factor	Additional Explanation/Comments
III. INNER SETTING				Municipally funded recreation and sport facilities participating in the Eat, Play Live (EPL) study
A. Structural Characteristics				
1. Physical Infrastructure	No	No themes or factors emerged		
2. Information Technology Infrastructure	No	No themes or factors emerged		
3. Work Infrastructure	Yes	Authority and autonomy to initiate and/or enforce change with the food environment	Contract predominance • Heathy options stipulations versus not	Affected CBI Lead ability to action and/or enforce change
			Contracts may be controlled by different levels of municipal government	Jurisdiction i.e., municipal pouring contracts
		Assuming responsibility for oversight	Defining where responsibility lies for monitoring	
			Actioning oversight and enforcement	Assuming responsibility for monitoring and enforcing guidelines at the facility level facilitated success
		Adapting to changes to employment tasks and staff responsibilities	Food service staff skill requirements	Facilities varied in capacity to adapt food service staff skill to facilitate preparation of healthier foods
			Accommodating food preparation time	Flexibility to adapt to change from ‘quick serve’ norm
B. Relational Connections	Yes	Optimizing varying relationships with food service providers		Building or maintain supportive relationships with concession and vending operators supported guideline implementation
		Building and leveraging partnership with local Public Health RD		Developing and utilizing relationships with PH RDs (see II D Partnerships & Connections)
		Relationships developed with EPL provincial coordinator and community	Between EPL provincial coordinator and CBI Lead Shared relationship with EPL community	Valuable relationships for all case facilities

Construct	Distinguishing	Theme/Factor	Sub-theme/Sub-factor	Additional Explanation/Comments
C. Communications	Yes	Building an innovation & EPL intervention support community	Engagement and interaction with like minded community Participating in EPL teleconference opportunities	CBI Leads valued intervention teleconferences: Safe place to ask questions; sharing of strategies, ideas, success stories, etc. CBI Lead engagement varied
		Communication initiation and engagement with EPL provincial coordinator	Utilizing EPL provincial coordinator access and check-ins	Engagement with PCs varied between MS and LS CBI Leads: LS did not access EPL PCs or participate in check-ins as fully
		Facility stakeholder communication	Communication and engagement variation across a range of stakeholders	Facility partners: e.g., leagues Food service providers Municipal partners
D. Culture	No	Recognizing ‘Arena food’ norms		Expectations for type of food - Traditional arena type food - Expectation for ‘quick serve’ See also Tension for Change, Innovation Deliverers, Innovation Recipients
		Patron autonomy of food choice		Perception that guidelines interfered with patron choice
E. Tension for Change	Yes	Navigating resistance to change		Resistance across all facilities
		Forces propelling change - Buy-in from leadership and patrons - Pre-existing push for change - Value-centred push for change		MS facilities experienced stronger forces for positive change i.e., parents, municipal/management leadership, survey feedback
F. Compatibility	Yes	Guideline compatibility with food service governance, processing and perspectives	Contract barriers and opportunities - Multiple contracts - Contract control can be across different levels of municipal government¹ - Variation across operational areas - Presence of healthy product clauses² - Absence of healthy product clauses³	¹ i.e., municipal pouring contracts; facility level concession contracts ² Enforcement of healthy product clauses i.e., need to monitor contract adherence ³ Current contract(s) must expire to initiate change
			Operational control barriers and opportunities	⁴ Including municipal, private contractors, volunteer organization, leagues, or associations within the facility

Construct	Distinguishing	Theme/Factor	Sub-theme/Sub-factor	Additional Explanation/Comments
			• Variation in level of operational control • May be operated by a different food service provider (Multiple contractors)⁴ • Different levels of municipal involvement⁵ • Franchise concession operators have limited/no control over product⁶ • Offerings, menu labelling, pouring contracts, etc.	⁵ i.e., municipally, but at a different/higher level ⁶ Major bottler/distributor control over product mix i.e., Coke, Pepsi
			Food service provider willingness and ability to alter current systems	
			Perceived Incompatibility with concession business model	Focus on ‘bottom line’ versus healthfulness
		Divergence from traditional arena food preparation and processes	Disruptive of existing workflow	See also Work Infrastructure
			Incompatible with traditional food offerings	
G. Relative Priority	Yes	Guideline implementation in the face differing priorities	Food service an auxiliary amenity versus food service aligned with health	For LS: Facility operations such as sport and programming were operational areas of higher priority and food service lower Not a significant ‘budget line’ item (i.e., not important enough to justify time and effort) See also Mission Alignment
			Competing priorities • EPL facility reps • Staff	LS: i.e., time; human resources
			Food service providers financial priorities	
			Patron priority	MS: Healthier options perceived as a priority
			Consequences of experience with prior initiatives	Previous experience outcomes could increase or decrease priority
H. Incentive Systems	No	No themes or factors emerged		
I. Mission Alignment	Yes		Health as a core business	Facility voluntary participation in EPL

Construct	Distinguishing	Theme/Factor	Sub-theme/Sub-factor	Additional Explanation/Comments
		Charting competing facility missions and goals	Mandate to align healthy food practices with physical activity promotion	MS CBI Leads expressing perception of alignment Recognition of high child attendance and child focussed programming
			Buy-in to healthy food environment being within facility mission varied Perception food service offered as an auxiliary service	Focus on perceived patron satisfaction versus health Aligns with culture construct and belief in autonomy regarding food practices
			Financial responsibility Revenue loss irresponsible	LS perceived a conflict: Food service revenue generating versus health focus Links to assumption/fear that healthier options result in financial loss which does not align with profitability
			Conflicting user groups	Children attending rec facility versus entertainment venue
J. Available Resources	No	Resource availability does not translate to resource utilization	Common guideline implementation support resources - Digital resources - EPL resources	Resources common across facilities Digital: brand name food list; provincial web sites providing guidance on categorization; sample RFPs and contract clauses; etc. EPL: Tool kits (online), decals/signage, etc.
1. Funding		Individualized EPL funding utilization		\$1000 – facility chose where to spend e.g., menu boards
2. Space		No themes or factors emerged		Physical space is not a factor for implementing nutrition guidelines
3. Materials & Equipment		Fully equipped concession		
		Promotional materials supporting healthier choices	Menu board Signage	Stickers, banners, digital facility media
K. Access to Knowledge & Information	Yes	Resource and guidance utilization support enhanced capacity	Access to and understanding of provincial guidelines varied Guideline definitions & ‘healthier’ product targets	MS & LS facilities differed in awareness and utilization of knowledge and information-based resources and accessing available guidance and training

Construct	Distinguishing	Theme/Factor	Sub-theme/Sub-factor	Additional Explanation/Comments
			• How ‘healthier’ is defined provincially and translates to product offerings • Lack of understanding of guideline categories, nutrition profiles, etc. by those responsible for contracts and/or facility-level policy	
			Utilization EPL CBI resources varied • Online information-based resources • CBI training • Teleconferences Accessing provincial coordinator support and guidance • Check-ins • On-going access	Online resources included: • Features and benefits of healthier options; rationale for change; etc. • Structuring contracts • RFPs • Facility-level policy development Also see ‘Available Resources’
IV. INDIVIDUALS DOMAIN				
ROLES SUBDOMAIN				Documentation of roles applicable to guideline implementation and CBI
A. High-level Leaders B. Mid-level Leaders	Yes	Leadership endorsement and active support critical for change	Decision-making leadership roles varied • Range of leadership responsibility positioning • Municipal leadership support and encouragement • Facility leadership support and encouragement	Definitive leadership support and encouragement necessary for change action MS facilities identified strong leadership: taking responsibility for implementation action (Contracts, facility-level policy, etc.) Note: defining high-level as outside of facility and mid-level at facility level
C. Opinion Leaders	No	No themes or factors emerged		
D. Implementation Facilitators	No	EPL coordinators instrumental supporting change		All facilities identified importance of PC relationship
		Public Health RD an asset	Consistency and strength of relationship key	PH RD identified as valuable for all facilities

Construct	Distinguishing	Theme/Factor	Sub-theme/Sub-factor	Additional Explanation/Comments
				MS facilities had stronger relationship with and consistency of individual in PH RD position
E. Implementation Leads	Yes	CBI Lead a defining role for actioning change	Level of engagement varied	MS facility leads more fully engaged
			Ability to action & influence change varied • Position level within facility or municipality • Authority	Authority and ability to action change required varied between MS and LS facilities
			Person filling CBI Lead role consistent (over intervention period)	Consistency of person filling CBI Lead role facilitated engagement, commitment and ability to support change; Consistent for MS facilities
F. Implementation Team Members	Yes	Facility health team enhanced engagement	Formation and engagement of health team varied	(Captures roles not identified A-E or H-I) MS health team engagement clearly identified as an asset; facilitates implementation
		Food service providers inclusion advances implementation		Food service representative participation in intervention planning and action an asset for implementation action Not across all facilities – supporting role varied across facilities
G. Other Implementation Support	No	No themes or factors emerged		
H. Innovation Deliverers	Mixed	Food service providers’ support essential for progress	Variation in support of changes to better align with provincial guidelines	Food service providers are responsible for food and beverage offerings; not all were supportive of implementing nutrition guidelines
I. Innovation Recipients	No	Facility patrons central to change	Variation in patron groups impacts offerings • Children versus other user groups	Facility patrons are defined innovation recipients

Construct	Distinguishing	Theme/Factor	Sub-theme/Sub-factor	Additional Explanation/Comments
CHARACTERISTICS SUBDOMAIN				Documentation of characteristics applicable to roles applicable to guideline implementation and CBI
A. Need	No	Recognizing rationale for change	Value of providing healthier food environment	Benefit of healthier food environment recognized across facilities • High child attendance
B. Capability	Yes	Demonstrated capability of CBI Lead a defining factor for change	Multiple factors influencing CBI Lead implementation action • Actioning implementation plans • Possessing skills/resources to institute appropriate contracts and or facility-level policy • Possessing knowledge of guidelines and how they translate to product offerings • Awareness, access and use of intervention and implementation resources • Engaging with food service providers	MS facility CBI Leads demonstrated greater competence, knowledge and skills to fulfill implementation lead role
C. Opportunity	Yes	Autonomy and authority required to initiate change	Power and authoritative scope varied By operational area	LS CBI Leads had less leadership support and/or initiative to act
			Contractual obligation conflicts • Presence or absence of healthy product clauses &/or competition clauses influence opportunities for change action	See Work Infrastructure
		Time availability a requisite for taking action		Time and staff availability a limiting factor for LS facilities
D. Motivation	Yes	CBI Leads expressed a range of motivational influences	Varied commitment and enthusiasm	Greater commitment and enthusiasm demonstrated by MS facilities Note that no themes emerged for other individuals involved

Construct	Distinguishing	Theme/Factor	Sub-theme/Sub-factor	Additional Explanation/Comments
			Endorsement from higher leadership/management influenced motivation	
		Food service providers’ interest and commitment varied	Revenue a strong motivational influence	Across all facilities some food services providers refused to participate in implementation and/or intervention See Cost construct
			Contract enforcement a motivational influence: positive or negative	See Work Infrastructure construct
V. IMPLEMENTATION PROCESS DOMAIN				Guideline implementation activities and strategies used as part of EPL participation
A. Teaming	Yes	Team development an important pillar for CBI implementation action	Fostering collaboration supported action - EPL coordinator and facility contact or facility team - Collaboration with concession and vending operators - PH RD	Teaming and relationship development varied across facilities and across operational areas within facilities
			Unsuccessful collaboration efforts can prompt change	Changes made to actors, (league managing concession) supported change in one facility
		Relationships developed outside of individual facilities can bolster implementation action		Other EPL participant facilities, Organizational partners, External product suppliers
B. Assessing Needs				
1. Innovation Deliverers	Yes	Navigating food service providers’ fear of revenue loss	Recognition of source of revenue-related fears - Patron demand - Competitive foods - External and internal franchises - Equitable internal competition⁷ - Food waste (e.g., stale dated and spoiled products)	Assessment and recognition of food service providers’ needs more strongly evidenced in MS facilities ⁷ Need consistent product categorization guidelines across operational areas

Construct	Distinguishing	Theme/Factor	Sub-theme/Sub-factor	Additional Explanation/Comments
		Characterizing supports for CBI Leads to advance CBI and guideline implementation	- Products not selling - Margins⁸	⁸ Healthier options described as having lower margins
			Support from higher level stakeholders	e.g., municipality, facility management
			Guidance integrating healthier options in collaboration with food service providers	
			Available resources to support change Including expert support	e.g., RFP and contract guidance
			Nutrition environment regulated policy	
2. Innovation Recipients	Yes	Direct Patron Assessment	Use of surveys to assess patron wants and needs	Differentiating approach and interpretation between MS and LS facilities conducting surveys
		Perception of patron expectations guiding offerings	Norms guiding perceived patron expectations	Perceived demand used to justify providing less healthy options
			Food choice autonomy Perceived patron desire for autonomy around food choice	
		Attention to user groups	Adapting to differing needs across patron groups	Perception of varying needs and wants for different patron groups
C. Assessing Context	Yes	Food culture	Navigating seemingly entrenched cultural norms	Overall, MS more adept at identifying and navigating contextual facilitators and barriers Perceived norms a barrier for all facilities
			Necessity of buy-in to nutrition guidelines within this setting	MS facilities stronger buy-in for the value of guidelines and this facilitated change action
		Nutrition policy	With food service contracts - Healthy nutrition clause - No nutrition guidelines - Operational management level⁹	Contracts a critical product control factor and contract factors varied across facilities and operational areas ⁹ e.g., municipal, facility-level
			Facility-level policy Facilitated increased healthfulness	Recognition facility-level policy a contextual strength Not in place for any facilities at start of CBI

Construct	Distinguishing	Theme/Factor	Sub-theme/Sub-factor	Additional Explanation/Comments
		Fear of revenue loss	Understanding vending/Concession food service providers fear of revenue loss	
		Consequences of prior experience/exposure to improving facility food environments		Recognition that prior experience could be a facilitator or barrier
		Control of product offerings	Distinguishing level of operational control of concession/vending as a factor in change action	Operational control identified as an important factor controlling menu and packaged food and beverage options
D. Planning	Yes	Harnessing CBI planning and goal-setting	Differing approaches to defining of goals, steps, tasks (including roles), and metrics	MS vs LS: Concrete/clearly defined versus explore/review; level of ambiguity versus actionable goals
			Actioning plan updates & revisions	Greater follow-up and follow-through by MS facilities
		Facility CBI contact contribution	Level of involvement and/or responsibility for actioning intervention	Link between involvement of contact and planning/goal setting/actioning plans
E. Tailoring Strategies	Yes	Planning and actioning goals with attention to contextual factors	Anticipating and adapting to context challenges	LS facilities describe getting stuck due to contextual factors e.g., food service provider contracts
			Identifying context-focused strategies	e.g., contract clause enforcement; responding to patron survey
		Collaboration for strategy development		Collaboration with PC and PH RD a key factor in strategic development
		Prescriptive guidance as a strategic approach		Identified as an approach to mitigate other context factors and ease transition to a healthier environment
F. Engaging	Yes	Action reflected CBI Lead engagement	Ongoing engagement with intervention/implementation team	MS facility representatives highly engaged e.g., attending teleconference meetings, responding to check-ins from provincial coordinator
			Actions undertaken	
			Collaboration with food service providers	
1. Innovation Deliverers	Mixed	Food service variation in participation and commitment		Concession food service providers participation in planning and actioning

Construct	Distinguishing	Theme/Factor	Sub-theme/Sub-factor	Additional Explanation/Comments
		Varied approaches to improving food environment healthfulness		changes to food offerings varied across both operational areas and facilities
			Menu changes	
			Utilizing expertise and experience of food service providers to make change	
			Use of signage to promote healthier options	
			Product presentation	
			Tailoring products to user groups	
			Fulfilling contracts/agreements	voluntary, proactive versus reacting to contract enforcement
			Addressing non-modifiable barriers	
2. Innovation Recipients	No	Approaches and efforts to support patron healthier choices varied	Obtaining input on preferences	e.g., patron survey
			Communicating with patrons around making healthy food choices • Sharing features and benefits of healthier options • Sharing rationale for changes to food offerings • Identifying healthier menu options • Promoting healthier options	e.g., product sampling, educational/informational signage
G. Doing	Yes	Actioning implementation plans	Actioning existing contracts and policies	MS facilities fuller optimization of planned action (See also planning construct) e.g., monitor contract adherence
			Action targeting food environment culture shift • Changing menu defaults to healthier options⁹ • Removing Do Not Sell products from sight lines • Promoting healthier options¹⁰	⁹ Change must be apparent to patrons and actioned by food service staff e.g., from fries to salad ¹⁰ e.g., menu prompts, use of EPL promotional materials

Construct	Distinguishing	Theme/Factor	Sub-theme/Sub-factor	Additional Explanation/Comments
			Menu additions and revisions increasing healthier options	
			Building in stepwise approach(es) to increasing healthier options	e.g., phased in proportional increases in healthier options within food service contracts
			Developing and instituting facility-level policy	
		Laying groundwork for further action	Steps to support future action	e.g., instituting internal policies
H. Reflecting & Evaluating	Not applicable as a distinguishing construct			Focus of the construct is feedback and next steps following CBI rather than assessing distinguishing characteristics of the intervention
1. Implementation		Evaluating CBI success	Assessment measures included • Facility audits • Implementation summaries • CBI Lead interviews	Outcome measures and qualitative data used to assess guideline uptake and CBI process
		Provision of feedback and guidance	EPL team provided summary report to EPL facilities	Feedback, e.g., food audit outcomes, would support on-going implementation
2. Innovation		Sales data to assess patron uptake	Refusal to provide data	Sales data requested for innovation implementation level assessment: most food service providers refused
I. Adapting	Not applicable as a distinguishing construct			Beyond EPL scope: next steps following CBI See also Table 4
Innovation: Provincial nutrition guidelines for food offerings in municipally funded recreation facilities Intervention: Eat, Play, Live capacity building intervention Inner setting in the context of the recreation and sport facility food environment: recreation and sport facility, municipality, leagues Distinguishing: Yes, No, Mixed				