Retail food environments research in Canada: A scoping review

Leia M. Minaker, MSc, PhD,¹ Alanna Shuh, BSc,¹ Dana L. Olstad, RD, PhD,² Rachel Engler-Stringer, PhD,³ Jennifer L. Black, PhD,⁴ Catherine L. Mah, MD, PhD⁵

ABSTRACT

OBJECTIVES: The field of retail food environments research is relatively new in Canada. The objective of this scoping review is to provide an overview of retail food environments research conducted before July 2015 in Canada. Specifically, this review describes research foci and key findings, identifies knowledge gaps and suggests future directions for research.

METHODS: A search of published literature concerning Canadian investigations of retail food environment settings (food stores, restaurants) was conducted in July 2015 using PubMed, Web of Science, Scopus, PsychInfo and ERIC. Studies published in English that reported qualitative or quantitative data on any aspect of the retail food environment were included, as were conceptual papers and commentaries.

SYNTHESIS: Eighty-eight studies were included in this review and suggest that the field of retail food environments research is rapidly expanding in Canada. While only 1 paper was published before 2005, 66 papers were published between 2010 and 2015. Canadian food environments research typically assessed either the socio-economic patterning of food environments ($n=28$) or associations between retail food environments and diet, anthropometric or health outcomes ($n=33$). Other papers profiled methodological research, qualitative studies, intervention research and critical commentaries ($n=27$). Key gaps in the current literature include measurement inconsistency among studies and a lack of longitudinal and intervention studies.

CONCLUSION: Retail food environments are a growing topic of research, policy and program development in Canada. Consistent methods (where appropriate), longitudinal and intervention research, and close partnerships between researchers and key stakeholders would greatly advance the field of retail food environments research in Canada.

KEY WORDS: Food; environment; inequalities; Canada; review

La traduction du résumé se trouve à la fin de l'article.

Can J Public Health 2016;107(Suppl. 1):eS4–eS13
doi: 10.17269/CJPH.107.5344

Unhealthy diets, which are common in Canada,^{1,2} are important modifiable primary risk factors for many non-communicable diseases.^{2–4} Dietary behaviours and their downstream effects on health are constrained and embedded within individuals' social, economic and physical environments.^{5–9} Indeed, poor diets may be a logical response to current food environments, which typically promote the purchase of energy-dense, nutrient-poor foods.¹⁰ The food environment includes geographic access to retail food sources as well as marketing within those sources.⁸

Food environments, which are often (although inconsistently) associated with dietary behaviours and downstream effects on health status,^{7,11–15} are a rapidly expanding area for both research and policy and program development in North America.^{5–9} Although several peer-reviewed literature reviews have summarized the state of the evidence on associations between retail food environments and health,^{7,11–13,15–17} none has focused specifically on Canadian retail food environments. This is important, because existing reviews of Canadian retail food environment studies have found that Canada may face unique food environment issues. For example, unlike the situation in the US,¹⁸ there is a lack of evidence for the widespread existence of “food deserts” in Canadian cities (neighbourhoods that are simultaneously materially deprived and have low geographic access to nutritious, affordable food sources).^{8,19} On the other hand, urban “food

swamps” (neighbourhoods that are both materially deprived and have high geographic access to food retailers perceived as promoting mainly minimally nutritious food options such as fast food outlets and convenience stores) seem to be common.^{8,19} Therefore, initiatives like the US Department of Health and Human Services Healthy Food Financing Initiative,⁹ which aims to ameliorate food deserts by promoting fresh, nutritious food provisioning, may not be useful within the urban Canadian context. However, research in Canada's northern and remote communities has not yet used objective measures of the retail food environment.^{20,21} Therefore, while these communities may well be considered food deserts by local residents, no empirical evidence

Author Affiliations

1. Propel Centre for Population Health Impact, University of Waterloo, Waterloo, ON
2. Centre for Physical Activity and Nutrition Research, School of Exercise and Nutrition Sciences, Faculty of Health, Deakin University, Geelong, VIC, Australia
3. Department of Community Health and Epidemiology, University of Saskatchewan, Saskatoon, SK
4. Food, Nutrition and Health, University of British Columbia, Vancouver, BC
5. Faculty of Medicine, Memorial University of Newfoundland, St. John's, NL

Correspondence: Leia Minaker, PhD, Propel Centre for Population Health Impact, University of Waterloo, 200 University Ave W, Waterloo, ON N2L 3T1, Tel: 519-888-4567, ext. 32756, E-mail: lminaker@uwaterloo.ca

Acknowledgement: LMM acknowledges the support of the Canadian Cancer Society Research Institute [Major Program Grant #701019] to the Propel Centre for Population Health Impact. DLO is supported by a Canadian Institutes of Health Research Fellowship.

Conflict of Interest: None to declare.

Table 1. Literature search strategy

Topic	Search terms
Food environment	Food environment OR nutrition environment OR retail food OR neighbourhood OR neighborhood OR environment OR food desert* OR food swamp OR food availability OR food cost OR food affordability OR food price* OR food quality
Retail food outlets	Supermarket OR grocery store OR convenience store OR corner store OR dollar store OR fast food OR restaurant OR food store OR bodega OR tienda
Dietary intake	Food OR fruit OR vegetable OR diet* OR nutrition OR processed food
Weight- and health-related outcomes	Obes* OR overweight OR BMI OR body mass index OR waist circumference OR anthropometric OR health OR cardiovascular OR cancer OR diabetes OR hypertension OR disease OR illness
Socio-economic status	Income OR disparity OR equity OR inequity OR inequality OR disadvantage OR poverty OR deprived* OR marginaliz*
Canada	Canada OR Canadian OR British Columbia OR Alberta OR Saskatchewan OR Manitoba OR Ontario OR Quebec OR Nova Scotia OR New Brunswick OR Prince Edward Island OR Newfoundland OR Yukon OR Northwest Territories OR Nunavut

* A Boolean search function indicating truncation, allowing multiple forms of a given word (e.g., *depriv** identifies *deprived*, *deprivation*).

has yet quantified the extent of food deserts in northern Canada or the impacts on nutritional health.^{8,19}

As Canadian public health decision-makers and practitioners^{8,22–25} and non-governmental organizations (NGOs)²⁶ are increasingly recognizing their role in creating and supporting healthy food environments, there is an urgent need to synthesize Canada-specific food environments literature to support evidence-based decision-making. Therefore, the objective of this scoping review is to provide an overview of peer-reviewed Canadian retail food environments research and commentary by describing emerging research topics and findings, identifying knowledge gaps and suggesting future directions for research and practice.

METHODS

Conceptual framework

Glanz and colleagues' widely-cited conceptual model of community nutrition environments theoretically underpins the current review.²⁷ The model specifies various environmental variables that influence eating patterns, including the *community* nutrition environment, which is typically reflected in measures of geographic food access, and the *consumer* nutrition environment, which includes the availability of nutritious foods, in-store marketing and the availability of nutrition information in restaurants. Individual socio-demographic factors are thought to moderate or mediate relationships between food environments and eating patterns. This review focuses on features of *community* and *consumer* nutrition environments (hereafter the retail food environment).

Search

PubMed, Web of Science, PsychInfo, ERIC and Scopus were searched in July 2015 for peer-reviewed articles published in English up to and including June 2015. A broad range of terms relevant to the retail food environment were used in various combinations, and these are presented in Table 1. Reference lists of included articles were also scanned. Articles with relevant titles were collected and reviewed (see Study Selection, below).

Inclusion and exclusion criteria

Studies published in English that reported qualitative or quantitative findings on some aspect of the retail food

environment were included, as were conceptual papers and commentaries. Studies concerning retail food environments situated within organizations such as schools and worksites were excluded, as were studies in recreational centres, since institutional procurement contracts and other operating policies add additional structural considerations that are beyond the scope of this review.^{28,29} Quantitative studies that did not concern a specific retail food environment setting as a function of a specific geographic area were excluded (e.g., studies that examined the overall Canadian food supply or food marketing in Canada).

Study selection

After removing duplicates, we scanned the titles of 420 articles. Initial exclusion was based on the title scan, after which the abstracts of the 191 remaining articles were reviewed to remove those articles that did not meet the inclusion criteria. Figure 1 shows a flow chart of included and excluded studies.

Figure 1. Flow chart of included and excluded studies

The full texts of the remaining 83 articles were reviewed in full by two authors working independently. An additional 9 articles were identified through citation searching of the 83. Four articles were removed during the full-text review. Relevant information (i.e., study population and setting, sample size, design, area-level covariates, outcomes, food environment measures and findings) was transferred from the included studies into a piloted Excel database. We verified all extracted data. Discrepancies were resolved within the research team by consensus.

Synthesis

We developed an a priori coding framework based on findings from two previous non-peer reviewed reviews of the Canadian retail food environments literature,^{8,19} which found that the majority of retail food environment studies in Canada were related to 1) associations between retail food environment features and behavioural, anthropometric or health outcomes, and/or 2) area-level socio-economic patterning of retail food environments. A third category was used to capture all “Other” relevant articles. The Other category included articles related to methodological development, qualitative research, intervention research, or critical commentary. The first two categories were not originally considered mutually exclusive, but after full-text extraction of data it was determined that each article could be definitively included in one category.

RESULTS

A total of 88 studies met all inclusion criteria and were included in this scoping review. Of these, 33 studies examined associations between retail food environment features and behavioural or health outcomes, 28 studies examined area-level socio-economic patterning of retail food environments, and 27 studies addressed other topics (Supplementary Table 1; see ARTICLE TOOLS section on journal site). The earliest study was published in 1997, and the remaining 87 studies were all published after 2005, with 66 (75%) published since 2010. Figure 2 shows the number of studies published by year and by category.

Associations between retail food environment features and behavioural, anthropometric or health outcomes

Of the 33 studies examining associations between retail food environment features and behavioural, anthropometric or health-related outcomes, 23 (70%) examined food environments within cities ($n=7$ Montreal and/or Quebec City; $n=7$ Greater Toronto Area, of which 2 also examined food environments in Vancouver; $n=4$ London; $n=2$ Edmonton; $n=2$ Ottawa; $n=1$ Region of Waterloo), 4 examined the retail food environment within provinces ($n=2$ Ontario; $n=1$ Alberta; $n=1$ Nova Scotia), and 6 examined retail food environments at a national level. Half ($n=3$) of the national studies examined retail food environments around schools. All but one study³⁰ were cross-sectional. About a third ($n=13$) controlled for area-level socio-economic variables and about a quarter ($n=8$) controlled for area-level demographic variables in analyses, which is important because of the potential for these variables to confound associations between food environment exposures and relevant outcomes.

In terms of exposure measures, all but two studies examined the community nutrition environment. Of these, 30 (97%) used

Figure 2. Number of studies of the retail food environment published by year and by topic

density measures (e.g., number of food stores per census tract) to define retail food environment exposures and eight (26%) used proximity measures, such as closest distance from home to retailers. All studies that used proximity measures to define food environment exposure also used density measures. Only one study used measures of the consumer nutrition environment³¹ (e.g., linear shelf space of fruits and vegetables), and two used activity space measures (i.e., people-based measures rather than place-based measures, which consider people’s retail food environment exposures based on their daily travel patterns) to define food environment exposures.^{32,33} Four studies used perceived measures of the food environment to define retail food environment exposure (two of which used both perceived and objective retail food environment measures^{31,34}).

Finally, in terms of outcomes, 18 studies (55%) examined associations between retail food environments and weight-related outcomes, of which 15 used self-reported measures (typically body mass index [BMI]). About 18% examined associations between retail food environments and health-promoting dietary behaviours (e.g., fruit and vegetable consumption), 18% examined minimally nutritious dietary behaviours (e.g., fast food consumption), 18% examined disease outcomes (e.g., cardiovascular disease), and one examined associations with food insecurity.³⁴

Overall, four studies (12%) found no association between retail food environment features and outcomes, 15 (45%) found mixed (i.e., some significant and some non-significant) results, and 14 (42%) found all significant associations. Significant associations were typically seen in the directions hypothesized by study authors. For example, a higher density of fast-food outlets around the home was associated with fast-food purchasing frequency among adolescents in London, ON,³⁵ and cardiovascular disease was positively associated with fast-food outlet density among adults living in Toronto.³⁶ Studies were diverse in terms of study populations, sample size, design, outcomes of interest and findings by area-level exposures of interest (socio-economic status, demographic characteristics and food environment exposures) (Supplementary Table 1).

Area-level socio-economic patterning of retail food environments

The majority of studies (75%) examined retail food environments within cities or counties, four (14%) examined food environments

Table 2. Other retail food environment research

Author (year)	Main findings
Methodological contributions	
Olstad et al. (2014)	This article reported on the process of creating a Report Card on Healthy Food Environments and Nutrition for Children for use in Canada. The Report Card was intended to be a metric assessing the extent to which current environments and policies support or create barriers to improving children's dietary behaviours. To develop the Report Card, the research team reviewed evidence-based indicators of supportive vs. not supportive policies and environments with an Expert Advisory Committee. The Report Card included 42 indicators and benchmarks that can be used to monitor the state of children's food environments and policies.
Clary et al. (2013)	This article compared alternative methods of establishing the validity of secondary geospatial data and proposed a new method (representativity) that may be more appropriate for validating secondary data sources of food environment data. Traditional and "relaxed" measures of sensitivity and positive predictive value were compared with a representativity score, which was calculated as $(TPs + FPs - FNs)/(TPs + FNs)$, where TP represents true positive, FP represents false positive and FN represents false negative. Traditional and relaxed measures indicated moderate capacity of the Enhanced Points of Interest (EPOI) (DMTI Spatial ®) secondary database to detect actual food outlets, with no evidence of systematic differences across 12 Montreal census tracts. Using representativity, the EPOI was found to have good validity. The authors argue for future research to make theoretically justified decisions about validity metrics based on the research objectives and methods used to assess food environment exposures. Additional files of note include 1) Standard Industry Classification code- and name-based assignment methods used to categorize food outlets, and 2) a classification tool aimed at facilitating categorization of food outlets found on site.
Minaker et al. (2013)	This article assessed the construct validity of four retail food environment measures along three constructs (food availability, food affordability and food quality) using multitrait-multimethod matrices, which are a traditional psychometric tool for evaluating construct validity. Measures included both objective and residential perceptual data, and food environment data were aggregated to 250 m, 500 m, 1000 m and 1500 m around respondents' households ($n = 2397$). Convergent validity (correlations between measures purportedly assessing the same construct) between objective measures decreased as geographic scale increased, and convergent validity between objective and perceived measures tended to slightly increase with increasing geographic scale. This article concluded that the construct validity of food environment measures varied by geographic scale, and that both measures and geographic aggregation of food environment variables should be theoretically justified on the basis of research objectives and hypothesized causal mechanisms.
Healy and Gilliland (2012)	This article examined the magnitude of distance errors and accessibility misclassification that result from using different types of address proxy common in public health research across urban, suburban, small town and rural southwestern Ontario. In terms of address proxies, using shortest path network distances from each resource to the residential address proxy this study found that lot centroids are the most accurate, followed by geocoded points, then street segment centres, postal codes, dissemination blocks, weighted dissemination areas, dissemination area and, finally, census tracts. Across neighbourhood types, junk food outlets (fast-food and convenience stores) accounted for the smallest number of positional discrepancies (compared with public recreation places, grocery stores, schools and hospitals), whereas grocery stores had a larger number of positional discrepancies than junk food places and public recreation places but a smaller number than schools and hospitals. This study also found that, in general, the smaller the distance threshold the greater percentage of addresses are misclassified, and the larger the geographic area of the unit of aggregation the greater the percentage of misclassified addresses. The article concluded with the importance of identifying and quantifying spatial errors so that research findings can be critically examined, and policies and programs can be evidence-based. Finally, postal codes were not recommended for use in rural and remote areas in Canada.
Seliske et al. (2012)	This article compared the validity of geospatial data from two databases (InfoCanada and the Yellow Pages) with observed data (using global positioning systems [GPS]). This study measured differences in the geographic information system (GIS) and GPS-derived locations using Euclidean (straight-line) distances. For both GIS databases, the percentage of discrepancies increased with smaller buffers. The Yellow Pages directory provided a greater proportion of listed food service places in the 1 km buffer, but the positional error did not differ between GIS databases. In total, about half of food service places were positioned within 25 m of their true location, and about 75% were positioned within 50 m.
Minaker et al. (2009)	This article described the development and implementation of food environment assessment tools designed to assess food service outlets on and around the University of Alberta. It categorized food service outlets as outlets selling Asian food, burger outlets, cafeterias, coffee shops, pizza places, sandwich shops, sit-down restaurants and smoothies outlets, according to observed consumer nutrition environment similarities within categories. The authors found that outlets with higher convenience (e.g., shorter wait times for foods) and higher value (kcal/dollar of commonly ordered items) tended to have fewer healthy foods available and promoted. In addition, this research found that unhealthy foods were far more available and more heavily promoted than healthier options in this setting.
Qualitative research	
Mannion et al. (2014)	This qualitative study from Calgary relied on go-along interviews with 5 recent Sudanese refugees to Canada and a qualitative focus group ($n = 8$ female Sudanese refugees). The objective of the study was to explore the acceptability of a nutrition resource developed to help recently immigrated Sudanese refugee women identify and purchase healthy foods and navigate grocery stores. The findings suggested that dietary acculturation is a relational process and is grounded in women and mothers as dietary gatekeepers of their families. One emergent theme was that grocery stores sold foods that were safe to eat, which, for this group of women, meant good food to eat. Navigating the grocery store was challenging for many participants because of language barriers as well as a lack of familiarity with many available foods. Finally, low transportation access, which many participants experienced (none had a driver's licence, for example), affected grocery store access.
Dyck-Ferau et al. (2013)	This qualitative study from the main reserve land of Alexander First Nation in Alberta relied on asset-mapping activities with a convenience sample of two high school students and seven grade 6 children. The study's objective was to understand extra-individual factors that influence the lifestyle behaviours of First Nations' children, including food consumption. Youth reported commonly consuming snacks from the convenience store (the only store on the reserve), where healthy food availability was limited. Food quality also was noted as a deterrent of food choice, as youth reported mice soiling certain food products. The convenience store was reportedly used by all residents, and although the food selection was limited, the store was highly accessible, open year-round with extended hours of operation.
McPhail et al. (2013)	This qualitative study relied on data from interviews with 51 teenagers (aged 12–19) recruited from rural towns across Canada. It explored the ways in which obesity is constructed as a rural disease in the Canadian context and demonstrated how understandings of food deserts and related rural obesity rely on classist imaginings of obesity as a working-class embodiment.
Pal et al. (2013)	This ethnographic and cost assessment study aimed to illustrate the costs associated with procuring traditional foods compared with the costs associated with buying store-bought foods in remote northern Ontario First Nations communities. Compared with the cost/kg of locally available store meats, the estimated cost/kg of traditional foods was higher for some hunting trips and lower for other hunting trips. The authors conclude that programs and policies to improve food affordability in northern remote communities should also include support of land-based food acquisition.

Continued

Table 2. (Continued)

Author (year)	Main findings
Skinner et al. (2013)	This study used qualitative, semi-directed interviews with 51 First Nations adults living in Fort Albany, ON, to explore participants' perceptions of food security and adaptive strategies used at individual and household levels to deal with food insecurity. Within this community, the high cost of store foods and the high prevalence of low household income were identified as barriers to accessing food. Store foods transported from the south were seen as foods that did not support community independence and self-sufficiency. Participants also noted that a grocery store opening in their community might help to improve food security and provided suggestions for the creation of non-traditional food retail in the community, such as a non-profit farmers' market, community garden and community greenhouse. Geographic access to high-quality, affordable foods was perceived as lacking, especially because there were only winter roads connecting the community to more southern communities.
Vahabi et al. (2013)	This cross-sectional, mixed-methods study explored perceived barriers in accessing safe, nutritious and culturally appropriate foods among a convenience sample of 70 adult Spanish/Portuguese speakers who had immigrated to Toronto, ON, in the previous five years. The majority of participants reported that discount grocery stores (where they predominantly shopped) were often far from home and were considered inaccessible without a car or nearby public transit, especially in the winter months. Geographically inaccessible discount grocery stores were a factor perceived to contribute to participants' food insecurity. In addition, language barriers were perceived as impeding access to nutritious foods in supermarkets, because participants were unable to read food labels and/or ask for certain foods. Finally, preferred cultural foods were often unavailable in nearby supermarkets.
McPhail et al. (2011)	This qualitative study explored reasons for fast-food consumption among a large cross-national sample ($n = 132$) of rural and urban Canadian teenagers. Qualitative findings show that fast-food consumption is not merely a function of geographic proximity to or density of fast food outlets but, rather, that teenagers engage in complex ways with different dimensions of choosing to consume or refrain from consuming fast foods. In this study, fast-food consumption did not seem to be related to the location of fast-food outlets nor to teens' socio-economic categories. Notably, this study found that teens approached fast food with a complex collection of social factors, individual preference and moral dictates. Moralistic notions of health – teens' conceptions of fast food as unhealthy and "bad" – were very salient in their consumption choice.
Retail food environment intervention research	
Fuller et al. (2015)	This study examined healthy and less healthy food purchasing over one year using grocery store sales data. The Good Food Junction (GFJ) (a not-for-profit, full-service cooperatively owned grocery store) was opened in a deprived neighbourhood in Saskatoon, SK, in a former food desert. The authors compared store members' total amount spent (\$) in 11 food categories – fruit, vegetables, meat and alternatives, dairy, grain, sugar-sweetened beverages, non-nutritive beverages, snack foods, prepared foods, flavouring and non-food items – by neighbourhood residence. Consumers who were residents of the former food desert neighbourhood spent significantly more on vegetables and significantly less on meat and on prepared foods compared with consumers who were not residents. The authors concluded that residents of the former food desert appeared to be accessing the grocery store for more healthy food purchases compared with their non-resident counterparts.
Lotoski et al. (2015)	This research examined awareness and use of the GFJ. Quantitative surveys with 365 primary household food shoppers living within a 750 m road network buffer of the GFJ were used to assess residents' awareness, use and mode of transportation to and from the GFJ, as well as to collect demographic data. The authors found that 95% of residents were aware of the GFJ, and 69% had shopped there at least once. Respondents identifying as Aboriginal were more likely than non-Aboriginals to have ever shopped at the GFJ. Aboriginal respondents also had higher odds of using GFJ as their primary grocery store compared with non-Aboriginal respondents. The authors concluded that the GFJ was able, and perhaps necessary, to serve as an important source of food for residents of marginalized neighbourhoods in a previous food desert.
Galloway et al. (2014)	This commentary addressed the federal government's Nutrition North Canada program, which purportedly aims to improve the food environment in northern, remote communities. This program is a federal subsidy to remote and semi-remote food retailers to make fresh, nutritious food more widely available and affordable in these communities. The author argues that the current reporting structure of the program made it impossible to determine whether stated objectives are being met. Similarly, an evaluation of whether the affordability of such foods has improved was considered impossible due to a lack of transparency in how the subsidy operates. Specific challenges to evaluation include: no indication of how subsidy rates are calculated; actual costs to shippers are not disclosed, and; the degree to which retailers pass along savings to consumers are unknown.
Hobin et al. (2013)	This between-groups experimental study evaluated the effect of "toy premiums" on 6–12 year old children's ($n = 337$) fast-food choices. Children were significantly more likely to select the healthier meals when toys were offered only with meals that met nutritional criteria, and the effect varied by sex and age. Younger children had higher odds of ordering the healthier meal than older children, and females had higher odds of ordering the healthier meal than males.
Mah et al. (2013)	This mixed-methods study assessed the feasibility of municipal jurisdictions adopting a menu labelling policy in Toronto, ON. First, a population-based telephone survey with 1,699 Torontonians found that 71% of respondents had eaten out at a restaurant and/or fast food outlet at least once in the previous week, 54% reported that it was important to have nutritious food when eating out, and 78% reported that they would use nutrition information on menu boards at least sometimes if it was available. A follow-up survey with 256 independent restaurant operators found that 72% were not interested in providing nutrition information to consumers, 76% reported believing that it was too expensive to provide such information on menus, 57% felt some responsibility to provide it, and 42% indicated interest in a pilot program. Finally, in-depth key informant interviews were completed with executives and key decision-makers at chain and franchise restaurants ($n = 9$). The findings from the interviews revealed that while industry generally supported the provision of nutrition information, it did not support displaying information on menus because of a perceived negative impact on business profitability.
Mead et al. (2012)	This article described the impact of a community-based, multi-institutional nutrition and lifestyle intervention implemented in three Inuit communities in Nunavut and three Inuvialuit communities in the Northwest Territories. Following an intervention that improved healthy food availability in local stores, and community-wide and point-of-purchase interactive activities, researchers found that the intervention group ($n = 246$ adults) had significantly lower frequency of unhealthy food acquisition before adjustment for confounders but no significant difference after adjustment. Second, the intervention had significantly increased self-efficacy and intentions for healthy eating. The authors also examined outcomes by socio-demographic and weight category subgroups. The intervention group significantly increased healthy eating intentions and decreased unhealthy food acquisition among overweight participants. Those with higher socio-economic status (SES) had significant improvements in healthy eating and psychosocial intentions compared with participants with low SES. The intervention significantly increased food knowledge and the use of healthier preparation methods among participants with a moderate material style of life score compared with those with a low material style of life, and among highly educated participants compared with participants with less education. Finally, the intervention was significantly negatively associated with food knowledge in employed households compared with unemployed.
Ho et al. (2008)	This article described the results of a quasi-experimental pretest/posttest impact evaluation of a multi-component diabetes prevention program in four remote or semi-remote First Nations communities in Ontario. The store component of the prevention program promoted healthier alternatives to commonly consumed foods using shelf labels, posters, cooking demos and taste tests in local stores. Store managers were additionally asked to stock healthier items if they were not already available. The overall results indicate that knowledge and frequency of healthy food acquisition improved among intervention residents, but no significant differences were found in body mass index between groups.

Continued

Table 2. (Continued)

Author (year)	Main findings
Ho et al. (2006)	This study described the development of a multi-component diabetes prevention program for First Nations communities in Ontario. As part of the development of the program, direct observations of consumers' food purchases were conducted at stores to note eating and purchasing behaviours of community residents. While support for a healthy food promotion in stores component was mixed in different First Nations communities, residents' feedback was used to refine the healthy food promotion strategies in stores to ensure that they would be acceptable to community residents.
Critical commentaries	
Sadler and Gilliland (2015)	This critical commentary presents a theoretical position upon which to build empirical research on food environments research. The authors argued that retail food environment intervention research should focus on more than just structural limitations to accessing food. The proposed theoretical foundation built upon considerations of governance systems in retail-based interventions, structuration theory and behavioural economics, and viewed consumers as predictably irrational consumers. The article concluded that policy responses to food deserts should be that of libertarian paternalism, which encourages people to make healthy choices while not restraining them from making unhealthy choices. Interventions emphasizing empowerment and local food production were seen as more promising than governments leading social change, and suggested that policy action at the local level is a feasible starting point.
Bedore (2014)	This commentary used case-study methods and in-depth qualitative interviews to critically analyze a food desert in Kingston, ON, and its responses. The food desert is used as a phenomenon through which complexities and tensions around the idea of choice in a classed society can be understood. Declining retail food access was described as compounding people's struggles with low income and leading to negative emotional consequences and injustice. Class paternalism was seen as narrowing food options for economically marginalized groups. Interviews with 27 participants revealed that low-income participants preferred to shop at an affordable supermarket rather than rely on food charity. Current responses to food deserts were viewed as coming mainly from privileged people and places, and representing a form of cultural imperialism based on societal understandings of class. To promote the dignity of economically vulnerable people, the author argued, requires public discussion about food deserts as a divisive spatial politics of oppression.
Bedore (2012)	This case study took a historical, critical political economy lens to explore a food desert in Kingston, ON, as a product of capital formation and rescaling over time. The industrialized retail food system was seen as creating and perpetuating a spatial logic in which it is almost impossible for a major retailer to target inner cities or older urban areas. The food desert problem was traced back to retail food industry changes from a decentralized, small-scale, neighbourhood-embedded retail food sector to the scaled-up retail food industry that exists today.
Fieldhouse and Thompson (2012)	This commentary was based on a narrative review of food insecurity in First Nations communities. The authors drew on the literature and their experiences to describe the high prevalence of food insecurity and approaches to tackling food insecurity in First Nations communities. First Nations children and youth tend to prefer store-bought food over traditional foods, and store-bought foods are often unaffordable and of poor quality because of the extended supply routes to get to remote communities. The authors concluded that efforts to address food insecurity in northern communities will require programs and policies that aim to enhance geographic access to affordable, nutritious foods.
Minaker et al. (2011)	This article reviewed food environment characteristics, theories, conceptual models and assessment methods and aimed to present a theoretical basis for the selection of food environment assessment methods by public health planners and other practitioners. A case study of the Region of Waterloo was presented to show how food environments measures may be used for developing local policy to support healthy food environments. The authors described the Region of Waterloo's Regional Official Plan and suggested that applications to build new developments could include consideration of how a new development will support residents' access to safe, nutritious and affordable foods.
Wegener and Hanning (2010)	This commentary provided an overview of alternative food networks and argued that alternative retail food outlets, such as farmers' markets, online grocery stores and community-supported agricultural groups, are a growing source of food for Canadians. The authors undertook a literature review to provide an overview of concepts, measures and methods for assessing traditional retail food stores, and provided a rationale for including alternative retail food outlets in future food environments research to more comprehensively evaluate food environment exposures.

within provinces, two national studies examined retail food environments around schools,^{37,38} and one study examined food environments in only a few neighbourhoods in Toronto, ON.³⁹ Most studies described food environments at the scale of administratively bounded units (e.g., census tracts) rather than person-specific buffers. Studies were diverse in terms of study populations, sample size, design and area-level measures, including those related to socio-economic status and demographic characteristics (Supplementary Table 2).

In the current review, studies examining "food deserts" were defined as those examining differences in geographic access to retailers often operationalized as "healthy food sources", such as grocery stores and fruit and vegetable markets, by area-level deprivation. Studies examining "food swamps" were defined as those that examined differences in geographic access to retailers that commonly offer minimally nutritious foods such as fast-food outlets and convenience stores, by area-level deprivation.⁸ Of the 28 papers examining the socio-economic patterning of food environments, 13 papers explored the existence of food deserts, 4 explored the existence of food swamps, and 9 papers explored both food deserts and food swamps. Of the two papers that explored neither food deserts nor food swamps, one examined

retail food environments around schools by size of city,³⁸ and one examined a retail food environment on the Six Nations reserve in southern Ontario.⁴⁰

Of the 22 papers that explored the existence of food deserts, 16 (73%) found that more deprived areas had equal or higher geographic access to stores selling healthy foods compared with less deprived areas. Four (18%) found small pockets or a few neighbourhoods that met the definition of food deserts, and two (9%) found evidence for the existence of food deserts in London, ON,⁴¹ and in Saskatoon, SK.⁴² Of note, both studies that found evidence of food deserts concluded that geographic access to healthy food in deprived neighbourhoods had worsened over time.

Of the 13 studies that explored the existence of food swamps, 11 (85%) found higher geographic access to sources of unhealthy foods in more deprived areas than less deprived areas, whereas two (15%) found mixed results. Two studies examined access to "unhealthy" or "healthy" retail food outlets relative to access to all food outlets. In Montreal, QC, the percentage of all restaurants that were fast-food outlets was negatively associated with area-level poverty, and the relative density of fruit and vegetable stores (as a proportion of all food stores) was positively associated with area-level poverty.⁴³ In Toronto, Brampton, Mississauga and Hamilton,

ON, there were no significant associations between relative access to unhealthy food sources and area-level material deprivation.⁴⁴

Other topics

Other Canadian articles relevant to retail food environments research can be broadly grouped as methodological contributions ($n=6$), qualitative research ($n=7$), retail food environment intervention research ($n=8$) and commentary or critical analyses ($n=6$). Table 2 provides an overview and description of the 27 “other” articles that were assessed. Methodological articles dealt exclusively with refining measures of food environment exposure rather than refining outcome measures in food environments research. The qualitative research to date has focused on how immigrants,^{45,46} adolescents^{47,48} and Indigenous peoples^{20,21,49} navigate and experience retail food environments. The intervention research was diverse and employed a range of study designs, methods and relevant outcomes (see Table 2). Finally, themes addressed by critical commentaries included discussion of the theoretical bases for empirical food environments research,⁵⁰ a commentary on a food desert in Kingston, ON, from a critical political economy perspective,⁵¹ and potential municipal policy and planning responses to food environments research.⁵²

DISCUSSION

This scoping review provided an overview of the published Canadian retail food environments literature. The majority of the 88 studies assessed here examined either socio-economic patterning of retail food environments ($n=28$) or associations between some aspect of the retail food environment and behavioural, anthropometric or health outcomes ($n=33$). The remaining 27 studies were fairly evenly split between qualitative research, methodological contributions, commentaries or critical analyses, and intervention research.

Key findings

Six key findings emerged through this review. First, urban Canadian food environments are different from those in the US, where the food desert metaphor is appropriate, given the bulk of evidence suggesting that food deserts are prominent in US cities.^{18,53} In urban Canada, the majority of studies have found that access to grocery stores and supermarkets in the more deprived areas is as good as or better than that of less deprived areas. On the other hand, this review found consistent evidence of food swamps in urban Canada, where more deprived areas have high geographic access to sources of minimally nutritious foods. That food swamps seem to be a more appropriate metaphor for urban Canada than food deserts has important policy and program implications. For example, “fixing” food swamps by enacting zoning bylaws that prohibit the opening of fast-food restaurants or convenience stores in a given neighbourhood may be far less politically palatable than “fixing” food deserts by promoting grocery stores or fresh food markets in deprived areas.

Second, in terms of scale, more than 70% of studies have examined retail food environments within cities, as opposed to within or across provinces and territories. This is an important limitation of the current Canadian literature, in particular because of the first law of geography, which reflects the phenomenon of spatial autocorrelation in its assertion that “... near things are more

related than distant things.” Therefore, food environment features within a city would be expected to show less variation than food environment features between cities, or across provinces or countries. This is problematic because true relationships between exposures and outcomes may be weak or non-existent if there is a lack of variability in the exposure variable. Therefore, even if there were a true relationship between food environments and dietary or health outcomes, the use of city-specific food environment data in Canadian studies would diminish the magnitude of the relationship. Moreover, the lack of rural food environments research in Canada (with a few notable exceptions^{54,55}) is a major limitation, given that one in five Canadians live in rural areas⁵⁵ and that rural Canadians are at a health disadvantage compared with their urban counterparts^{56–58} and have poorer diets, which may be in part explained by poor access to resources.⁵⁷ Future research should therefore explicitly consider rural retail food environments and should be conducted at a functional region (city-region or multiple municipalities of different sizes within an economic corridor) or provincial level, in addition to examining their associations with diet and anthropometric or health-related outcomes.

Third, and related to rural retail food environments, no published studies have examined objective features of retail food environments in indigenous communities. The qualitative evidence reviewed here showed that remote First Nations communities may indeed be considered food deserts^{20,21} and that residents of the Six Nations reserve in Ontario perceive poorer access to fruits and vegetables on-reserve than off-reserve.⁴⁰ Future research should objectively assess features of the retail food environments in indigenous communities to determine the prevalence of food deserts, especially in more remote Canadian communities, in order to develop appropriate and comprehensive program and policy responses.

Fourth, the vast majority (91%) of articles examining relationships between food environments and outcomes have defined food environment exposures within specific geographic areas using measures of density, rather than proximity or other measures (e.g., consumer nutrition environment measures or residents’ perceptions). This finding suggests that Canadian food environments researchers tend to conceptualize geographic access as density, although at least one study found that weight-related outcomes were more strongly associated with proximity measures than with density measures.³¹ Only one study to date has examined associations between consumer nutrition environment measures and dietary and anthropometric outcomes. This study was a population-based, cross-sectional study of residents in three southern Ontario cities. It found that the relative affordability of healthy to less healthy options was associated with self-reported BMI and waist circumference in both men and women, but that other measures of the consumer nutrition environment were inconsistently associated with dietary and weight-related outcomes.³¹ The lack of consideration of exposures within consumer nutrition environments found in Canadian research is consistent with previous systematic reviews of food environments research.^{12,17,32} A lack of assessment of the consumer nutrition environment is problematic, because assigning “healthy” or “unhealthy” attributes to different types of food premises or businesses, as happens in most studies of community food

environments, has been done to date somewhat arbitrarily, given variation in administrative or industry data sources for premise categorization, and assumes that consumer experiences are invariant within outlet types.¹⁷ Future research should endeavour to simultaneously examine community and consumer nutrition environment measures to comprehensively describe food environment exposures. Additional research using activity spaces^{60–62} to define exposures and research examining residents' perceptions of their food environments would also be beneficial in refining retail food environment exposure measures.

Fifth, the most common outcomes of interest were those related to obesity. More than half (56%) of studies examining relationships between food environments and dietary, anthropometric or health-related outcomes used weight-related measures such as BMI or waist circumference. Of these 19 studies, 16 (84%) used self-reported measures of weight and/or height. Although the health risks associated with variations in self-reported BMI are comparable with those associated with variations in measured BMI,⁶³ using self-reported BMI is a limitation because respondents generally overestimate height and underestimate weight.^{64,65} In terms of dietary outcomes, five studies examined minimally nutritious dietary behaviours (e.g., soft-drink consumption, fast food consumption), and six examined healthy dietary behaviours (e.g., vegetable and fruit consumption) or overall diet quality. Although the study authors typically did not include logic models that would specify hypothesized conceptual pathways by which food environment exposures might be associated with dietary outcomes, in all cases the measured exposure conceptually lined up with measured outcomes (e.g., exposure to fast-food outlets was measured alongside dietary intake at fast food outlets; exposure to all food outlet types was measured alongside comprehensive measures of diet quality). Of note, despite current discussions among public health practitioners and food-related NGOs of improving geographic access to healthy food as potentially helping to ameliorate food insecurity, only one published study examined supermarket proximity as a predictor of food insecurity and found no significant association.³⁴ Future research should clarify hypothesized mechanisms through which these associations might be mediated⁶⁵ and should consider exploring more proximal outcomes of interest (e.g., food purchasing) in addition to more distal outcomes (e.g., obesity).

Sixth, retail food environment intervention research is relatively new in Canada. Such interventions aim to support healthy dietary behaviours by improving the availability of affordable, nutritious food options in the community and/or by decreasing access to less nutritious options.²⁷ Retail food environment interventions typically have a strong health equity dimension,⁵⁹ because they are often set in places where spatial disparities in food access are likely to amplify the effects of inadequate household income.^{18,66} The earliest description of a food retail environment intervention was published in 2006.⁶⁷ It described the development of a multi-component diabetes prevention program in a First Nations community in Ontario that included a store component aimed at increasing the availability and promotion of nutritious foods. The findings of this intervention's impacts were mixed: frequency of healthy food acquisition improved among intervention residents compared with control residents, but no significant differences were found in BMI between groups.⁶⁸ Retail food environment

interventions have been diverse and have included a randomized controlled trial to determine the effect of toy premiums on children's fast food meal selection,⁶⁹ a mixed-methods study to assess the feasibility of a municipal menu labeling policy⁷⁰ and the Nutrition North Canada program, a federal subsidy to retailers to make fresh, nutritious foods more widely available in remote and semi-remote communities.⁷¹ The most recent intervention study used store sales data to examine healthy and less healthy food purchases over a one-year period in Saskatoon.⁷²

Intervention studies are needed in retail food environments research to advance the understanding of mechanisms through which food environments affect dietary outcomes and to facilitate the development of evidence-based, feasible and sustainable policies and programs to support Canadians' access to healthy, affordable foods. Future research should use food retailer sales data and potentially loyalty card data to objectively measure food purchasing at the store and consumer level respectively.⁷³ Sales and loyalty card data represent objective, theoretically proximal outcomes that may serve to elucidate mechanisms by which retail food environments ultimately influence dietary behaviours.

Strengths and limitations

The breadth and overarching objectives of this review are its major strength. Our systematic approach for identifying potentially relevant literature, including a systematic search of five electronic databases and use of two reviewers to screen and extract data from each paper, is also an important strength. However, several limitations should be noted. First, because of the objectives (i.e., to broadly describe research topics and findings, identify knowledge gaps and suggest future directions for research and practice), we did not apply quality filters, which is consistent with other scoping reviews.^{74,75} Despite this, searching only the peer-reviewed literature served as a de facto quality filter.

CONCLUSIONS

Retail food environments research in Canada is a rapidly expanding field. Findings from the literature indicate the need for context-specific research to evaluate the impact of food swamps in urban areas and potential food deserts in northern and remote contexts. Balancing valid and consistent methods with context-appropriate assessment methods is an ongoing challenge. Explicit justification for method selection is required in future research. Long-term collaboration among food environments researchers would likely contribute to a systematic approach to building the evidence base across urban, rural and remote contexts, which would be useful given the current disparate methods and measures employed in Canadian food environments research.

REFERENCES

1. Garriguet D. Canadians' eating habits. *Health Rep* 2007;18(2):17–32. PMID: 17578013. Available at: <http://www.statcan.gc.ca/pub/82-003-x/2006004/article/9609-eng.htm> (Accessed April 4, 2016).
2. Garriguet D. Diet quality in Canada. *Health Rep* 2009;20(3):41–52. PMID: 19813438. Available at: <http://www.statcan.gc.ca/pub/82-003-x/2009003/article/10914-eng.pdf> (Accessed October 22, 2015).
3. Vandevijvere S, Monteiro C, Krebs-Smith SM, Lee A, Swinburn B, Kelly B, et al. Monitoring and benchmarking population diet quality globally: A step-wise approach. *Obes Rev* 2013;14(Suppl 1):135–49. PMID: 24074217. doi: 10.1111/obr.12082.

4. World Health Organization. Diet, Nutrition, and the Prevention of Chronic Diseases, 2003. Available at: <http://www.who.int/dietphysicalactivity/publications/trs916/en/> (Accessed October 22, 2015).
5. Raine KD. Determinants of healthy eating in Canada: An overview and synthesis. *Can J Public Health* 2005;96(Suppl 3):S8–14. PMID: 16042158. doi: 10.17269/cjph.96.1499.
6. Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. Creating healthy food and eating environments: Policy and environmental approaches. *Annu Rev Public Health* 2008;29:253–72. PMID: 18031223. doi: 10.1146/annurev.publhealth.29.020907.090926.
7. Giskes K, van Lenthe F, Avendano-Pabon M, Brug J. A systematic review of environmental factors and obesogenic dietary intakes among adults: Are we getting closer to understanding obesogenic environments? *Obes Rev* 2011;12:e95–106. PMID: 20604870. doi: 10.1111/j.1467-789X.2010.00769.x.
8. Health Canada. Measuring the Food Environment in Canada, 2013. Available at: <http://www.hc-sc.gc.ca/fn-an/nutrition/pol/som-ex-sum-enviro-eng.php> (Accessed October 22, 2015).
9. US Department of Health and Human Services. Healthy Food Financing Initiative, 2015. Available at: <http://www.acf.hhs.gov/programs/ocs/programs/community-economic-development/healthy-food-financing> (Accessed October 22, 2015).
10. Kleinert S, Horton R. Rethinking and reframing obesity. *Lancet* 2015;385(9985):2326–28. PMID: 25703115. doi: 10.1016/S0140-6736(15)60163-5.
11. Engler-Stringer R, Le H, Gerrard A, Muhajarine N. The community and consumer food environment and children's diet: A systematic review. *BMC Public Health* 2014;14(1):522. PMID: 24884443. doi: 10.1186/1471-2458-14-522.
12. Caspi CE, Sorensen G, Subramanian SV, Kawachi I. The local food environment, shopping and diet: A systematic review. *Health Place* 2012;18:1172–87. PMID: 22717379. doi: 10.1016/j.healthplace.2012.05.006.
13. van der Horst K, Oenema A, Ferreira I, Wendel-Vos W, Giskes K, van Lenthe F, et al. A systematic review of environmental correlates of obesity-related dietary behaviors in youth. *Health Educ Res* 2007;22(2):203–26. PMID: 16861362. doi: 10.1093/her/cyl069.
14. Kamphuis CBM, Giskes K, de Bruijn GJ, Wendel-Vos W, Brug J, van Lenthe FJ. Environmental determinants of fruit and vegetable consumption among adults: A systematic review. *Br J Nutr* 2006;96(4):620–35. PMID: 17010219. doi: 10.1079/BJN20061896.
15. Kirkpatrick SI, Reedy J, Butler EN, Dodd KW, Subar AF, Thompson FE, et al. Dietary assessment in food environment research: A systematic review. *Am J Prev Med* 2014;46(1):94–102. PMID: 24355678. doi: 10.1016/j.amepre.2013.08.015.
16. Black JL, Macinko J. Neighborhoods and obesity. *Nutr Rev* 2008;66(1):2–20. PMID: 18254880. doi: 10.1111/j.1753-4887.2007.00001.x.
17. Cobb LK, Appel LJ, Franco M, Jones-Smith JC, Nur A, Anderson CAM. The relationship of the local food environment with obesity: A systematic review of methods, study quality, and results. *Obesity* 2015;23(7):1331–44. PMID: 26096983. doi: 10.1002/oby.21118.
18. Walker RE, Keane CR, Burke JG. Disparities and access to healthy food in the United States: A review of food deserts literature. *Health Place* 2010;16(5):876–84. PMID: 20462784. doi: 10.1016/j.healthplace.2010.04.013.
19. Black J. Local food environments outside of the United States – a look to the north: Examining food environments in Canada. In: Morland KB (Ed.), *Local Food Environments: Food Access in America*. Boca Raton, FL: CRC Press Taylor and Francis Group, 2014; 231–61.
20. Skinner K, Hanning RM, Desjardins E, Tsui LJS. Giving voice to food insecurity in a remote Indigenous community in subarctic Ontario, Canada: Traditional ways, ways to cope, ways forward. *BMC Public Health* 2013;13(1):427. PMID: 23639143. doi: 10.1186/1471-2458-13-427.
21. DyckFehderau D, Holt NL, Ball GD, Willows ND. Feasibility study of asset mapping with children: Identifying how the community environment shapes activity and food choices in Alexander First Nation. *Rural Remote Health* 2013;13(2):2289. PMID: 23534835.
22. Public Health Agency of Canada. *Curbing Childhood Obesity: A Federal, Provincial and Territorial Framework for Action to Promote Healthy Weights*. Ottawa, ON: Public Health Agency of Canada, 2010. Available at: <http://www.phac-aspc.gc.ca/hp-ps/hl-mvs/framework-cadre/index-eng.php> (Accessed June 18, 2015).
23. Mah C, Minaker L, Cook B. *Policy Options for Healthier Food Environments in City-Regions: A Discussion Paper*. Vancouver, BC: National Collaborating Centre for Environmental Health (NCEH), 2015.
24. Health Canada. Working with Grocers to Support Healthy Eating, 2013. Available at: <http://www.hc-sc.gc.ca/fn-an/nutrition/pol/som-ex-sum-grocers-epiciers-eng.php> (Accessed October 23, 2015).
25. Public Health Nutritionists of Saskatchewan. The Role of the Dietitian in the Built Environment, 2015. Available at: <http://www.fhhr.ca/Documents/TheRoleoftheDietitianintheBuiltEnvironmentPHNSWG2015FINAL.pdf> (Accessed October 2, 2015).
26. Food Matters Manitoba. Let's Grow our Local Food Economy, 2015. Available at: <http://www.foodmattersmanitoba.ca/2014/09/lets-grow-localfood-economy/> (Accessed October 10, 2015).
27. Glanz K, Sallis JF, Saelens BE, Frank LD. Healthy nutrition environments: Concepts and measures. *Am J Health Promot* 2005;19(5):330–33. PMID: 15895534. doi: 10.4278/0890-1171-19.5.330.
28. Olstad DL, Raine KD, McCargar LJ. Adopting and implementing nutrition guidelines in recreational facilities: Public and private sector roles. A multiple case study. *BMC Public Health* 2012;12(1):376. PMID: 22632384. doi: 10.1186/1471-2458-12-376.
29. Olstad DL, Raine KD. Profit versus public health: The need to improve the food environment in recreational facilities. *Can J Public Health* 2013;104(2):e167–69. PMID: 23618211. doi: 10.17269/cjph.104.3647.
30. Pabayo R, Spence JC, Cutumisu N, Casey L, Storey K. Sociodemographic, behavioural and environmental correlates of sweetened beverage consumption among pre-school children. *Public Health Nutr* 2012;15(8):1338–46. PMID: 22269184. doi: 10.1017/S1368980011003557.
31. Minaker LM, Raine KD, Wild TC, Nykiforuk CIJ, Thompson ME, Frank LD. Objective food environments and health outcomes. *Am J Prev Med* 2013;45(3):289–96. PMID: 23953355. doi: 10.1016/j.amepre.2013.05.008.
32. Kestens Y, Lebel A, Chaix B, Clary C, Daniel M, Pampalon R, et al. Association between activity space exposure to food establishments and individual risk of overweight. *PLoS One* 2012;7(8):e41418. PMID: 22936974. doi: 10.1371/journal.pone.0041418.
33. Lebel L, Krittasudthacheewa C, Salamanca A, Sriyasa P. Lifestyles and consumption in cities and the links with health and well-being: The case of obesity. *Curr Opin Environ Sustain* 2012;4(4):405–13. doi: 10.1016/j.cosust.2012.09.005.
34. Kirkpatrick SI, Tarasuk V. Assessing the relevance of neighbourhood characteristics to the household food security of low-income Toronto families. *Public Health Nutr* 2010;13(7):1139–48. PMID: 20196916. doi: 10.1017/S1368980010000339.
35. He M, Tucker P, Gilliland J, Irwin JD, Larsen K, Hess P. The influence of local food environments on adolescents' food purchasing behaviors. *Int J Environ Res Public Health* 2012;9(4):1458–71. PMID: 22690205. doi: 10.3390/ijerph9041458.
36. Chum A, O'Campo P. Cross-sectional associations between residential environmental exposures and cardiovascular diseases. *BMC Public Health* 2015;15(1):438. PMID: 25924669. doi: 10.1186/s12889-015-1788-0.
37. Seliske LM, Pickett W, Boyce WF, Janssen I. Association between the food retail environment surrounding schools and overweight in Canadian youth. *Public Health Nutr* 2009;12(9):1384–91. PMID: 19087383. doi: 10.1017/S1368980008004084.
38. Browning HF, Laxer RE, Janssen I. Food and eating environments: In Canadian schools. *Can J Diet Pract Res* 2013;74(4):160–66. PMID: 24472163. doi: 10.3148/74.4.2013.160.
39. Behjat A, Koc M, Ostry A. The importance of food retail stores in identifying food deserts in urban settings. *WIT Trans Ecol Environ* 2013;170:89–98. doi: 10.2495/FENV130091.
40. Joseph P, Davis AD, Miller R, Hill K, McCarthy H, Banerjee A, et al. Contextual determinants of health behaviours in an aboriginal community in Canada: Pilot project. *BMC Public Health* 2012;12(1):952. PMID: 23134669. doi: 10.1186/1471-2458-12-952.
41. Larsen K, Gilliland J. Mapping the evolution of 'food deserts' in a Canadian city: Supermarket accessibility in London, Ontario, 1961–2005. *Int J Health Geogr* 2008;7:16. PMID: 18423005. doi: 10.1186/1476-072X-7-16.
42. Peters EJ, McCreary TA. Poor neighbourhoods and the changing geography of food retailing in Saskatoon, Saskatchewan, 1984–2004. *Can J Urban Res* 2008;17(1):78–106. doi: 10.1016/j.apgeog.2011.01.010.
43. Mercille G, Richard L, Gauvin L, Kestens Y, Payette H, Daniel M. Comparison of two indices of availability of fruits/vegetable and fast food outlets. *J Urban Health* 2013;90(2):240–45. PMID: 22736278. doi: 10.1007/s11524-012-9722-6.
44. Polsky JY, Moineddin R, Glazier RH, Dunn JR, Booth GL. Foodscapes of southern Ontario: Neighbourhood deprivation and access to healthy and unhealthy food retail. *Can J Public Health* 2014;105(5):e369–75. PMID: 25365272. doi: 10.17269/cjph.105.4541.
45. Mannion CA, Raffin-Bouchal S, Henshaw CJ. Navigating a strange and complex environment: Experiences of Sudanese refugee women using a new nutrition resource. *Int J Women's Health* 2014;6(1):411–22. PMID: 24790470. doi: 10.2147/IJWH.S56256.
46. Vahabi M, Damba C. Perceived barriers in accessing food among recent Latin American immigrants in Toronto. *Int J Equity Health* 2013;12(1):1. PMID: 23286318. doi: 10.1186/1475-9276-12-1.
47. McPhail D, Chapman GE, Beagan BL. "Too much of that stuff can't be good": Canadian teens, morality, and fast food consumption. *Soc Sci Med* 2011;73(2):301–7. PMID: 21689876. doi: 10.1016/j.socscimed.2011.05.022.
48. McPhail D, Chapman GE, Beagan BL. The rural and the rotund? A critical interpretation of food deserts and rural adolescent obesity in the Canadian context. *Health Place* 2013;22:132–39. PMID: 23694820. doi: 10.1016/j.healthplace.2013.03.009.
49. Pal S, Haman F, Robidoux MA. The costs of local food procurement in two northern Indigenous communities in Canada. *Food Foodways* 2013;21(2):132–52. doi: 10.1080/07409710.2013.792193.

50. Sadler RC, Gilliland JA, Arku G. Theoretical issues in the 'food desert' debate and ways forward. *Geojournal* 2015;1–13. doi: 10.1007/s10708-015-9634-6.
51. Bedore M. Food desertification: Situating choice and class relations within an urban political economy of declining food access. *Stud Soc Just* 2014; 8(2):207–28.
52. Minaker L, Fisher P, Raine KD, Frank LD. Measuring the food environment: From theory to planning practice. *J Agric Food Syst Community Dev* 2011; 2(1):65–82. doi: 10.5304/jafscd.2011.021.021.
53. Sadler RC, Gilliland JA, Arku G. An application of the edge effect in measuring accessibility to multiple food retailer types in southwestern Ontario, Canada. *Int J Health Geogr* 2011;10:34. PMID: 21575162. doi: 10.1186/1476-072X-10-34.
54. Hollands S, Campbell MK, Gilliland J, Sarma S. Association between neighbourhood fast-food and full-service restaurant density and body mass index: A cross-sectional study of Canadian adults. *Can J Public Health* 2014; 105(3):e172–78. PMID: 25165835. doi: 10.17269/cjph.105.4287.
55. Statistics Canada. Population, Urban and Rural, by Province and Territory (Canada), 2011. Available at: <http://www.statcan.gc.ca/tables-tableaux/sums0101/cst01/demo62a-eng.htm> (Accessed July 28, 2015).
56. DesMeules M, Pong R, Lagace C, Heng D, Manuel D, Pitblado R, et al. *How Healthy are Rural Canadians? An Assessment of Their Health Status and Health Determinants*. Ottawa, ON: Canadian Institute for Health Information, 2006; ISBN 13: 978-1-55392-881-2 (PDF).
57. Lavergne MR, Kephart G. Examining variations in health within rural Canada. *Rural Remote Health* 2012;12(1):1848. PMID: 22384808.
58. Pampalon R, Hamel D, Gamache P. Health inequalities in urban and rural Canada: Comparing inequalities in survival according to an individual and area-based deprivation index. *Health Place* 2010;16(2):416–20. PMID: 20022551. doi: 10.1016/j.healthplace.2009.11.012.
59. Gustafson A, Hankins S, Jilcott S. Measures of the consumer food store environment: A systematic review of the evidence 2000–2011. *J Community Health* 2012;37(4):897–911. PMID: 22160660. doi: 10.1007/s10900-011-9524-x.
60. Kestens Y, Lebel A, Daniel M, Theriault M, Pampalon R. Using experienced activity spaces to measure foodscape exposure. *Health Place* 2010;16:1094–103. PMID: 20667762. doi: 10.1016/j.healthplace.2010.06.016.
61. Lebel A, Kestens Y, Pampalon R, Theriault M, Daniel M, Subramanian SV. Local context influence, activity space, and foodscape exposure in two Canadian metropolitan settings: Is daily mobility exposure associated with overweight? *J Obes* 2012;2012:912645;1–9. PMID: 22254135. doi: 10.1155/2012/912645.
62. Stommel M, Schoenborn CA. Accuracy and usefulness of BMI measures based on self-reported weight and height: Findings from the NHANES & NHIS 2001–2006. *BMC Public Health* 2009;9:421. PMID: 19922675. doi: 10.1186/1471-2458-9-421.
63. Shields M, Gorber B, Tremblay MS. Estimates of obesity based on self-report versus direct measures. *Health Rep* 2008;19:61–76. PMID: 18642520.
64. Gorber SC, Tremblay M, Moher D, Gorber B. A comparison of direct vs. self-report measures for assessing height, weight and body mass index: A systematic review. *Obes Rev* 2007;8(4):307–26. PMID: 17578381. doi: 10.1111/j.1467-789X.2007.00347.x.
65. Cummins S. Neighbourhood food environment and diet: Time for improved conceptual models? *Prev Med* 2007;44(3):196–97. PMID: 17222896. doi: 10.1016/j.ypmed.2006.11.018.
66. Mah CL, Timmings C. Equity in public health ethics: The case of menu labelling policy at the local level. *Public Health Ethics* 2015;8(1):85–89. doi: 10.1093/phe/phu011.
67. Ho LS, Gittelsohn J, Harris SB, Ford E. Development of an integrated diabetes prevention program with First Nations in Canada. *Health Promot Int* 2006; 21(2):88–97. PMID: 16407394. doi: 10.1093/heapro/dak003.
68. Ho LS, Gittelsohn J, Rimal R, Treuth MS, Sharma S, Rosecrans A, Harris SB. An integrated multi-institutional diabetes prevention program improves knowledge and healthy food acquisition in northwestern Ontario First Nations. *Health Educ Behav* 2008;35(4):561–73. PMID: 18456866. doi: 10.1177/1090198108315367.
69. Hobin EP, Hammond DG, Daniel S, Hanning RM, Manske SR. The Happy Meal® Effect: The impact of toy premiums on healthy eating among children in Ontario, Canada. *Can J Public Health* 2012;103(4):244–48. PMID: 23618634.
70. Mah CL, Vanderlinden L, Mamatis D, Ansara DL, Levy J, Swimmer L. Ready for policy? Stakeholder attitudes toward menu labelling in Toronto, Canada. *Can J Public Health* 2013;104(3):e229–34. PMID: 23823887. doi: 10.17269/cjph.104.3708.
71. Galloway T. Is the Nutrition North Canada retail subsidy program meeting the goal of making nutritious and perishable food more accessible and affordable in the north? *Can J Public Health* 2014;105(5):e395–97. PMID: 25365276. doi: 10.17269/cjph.105.4624.
72. Fuller D, Engler-Stringer R, Muhajarine N. Examining food purchasing patterns from sales data at a full-service grocery store intervention in a former food desert. *Prev Med Rep* 2015;2:164–69. PMID: 26844066. doi: 10.1016/j.pmedr.2015.02.012.
73. Glanz K, Bader MDM, Iyer S. Retail grocery store marketing strategies and obesity: An integrative review. *Am J Prev Med* 2012;42(5):S03–12. PMID: 22516491. doi: 10.1016/j.amepre.2012.01.013.
74. Arksey H, O'Malley L. Scoping studies: Towards a methodological framework. *Int J Soc Res Methodol: Theory Pract* 2005;8(1):19–32. doi: 10.1080/1364557032000119616.
75. Levac D, Colquhoun H, O'Brien KK. Scoping studies: Advancing the methodology. *Implement Sci* 2010;5(1):69. PMID: 20854677. doi: 10.1186/1748-5908-5-69.

RÉSUMÉ

OBJECTIFS : Le domaine de la recherche sur les environnements alimentaires au détail est relativement nouveau au Canada. Dans notre étude de champ, nous donnons un aperçu de la recherche sur les environnements alimentaires au détail menée avant juillet 2015 au Canada. En particulier, nous décrivons les objectifs et les principales constatations de la recherche, nous en cernons les lacunes et nous suggérons des pistes de recherche futures.

MÉTHODE : Nous avons interrogé les bases de données PubMed, Web of Science, Scopus, PsychInfo et ERIC en juillet 2015 pour recenser les enquêtes canadiennes publiées qui traitent des points de vente d'aliments au détail (magasins d'alimentation, restaurants). Nous avons inclus les études parues en anglais qui présentaient des données qualitatives ou quantitatives sur tout aspect de l'environnement alimentaire au détail, ainsi que les documents conceptuels et les commentaires.

SYNTHÈSE : Quatre-vingt-huit études ont été incluses dans notre revue, ce qui indique que le domaine de la recherche sur les environnements alimentaires au détail se développe rapidement au Canada. Un seul article avait été publié avant 2005, mais 66 l'ont été entre 2010 et 2015. La recherche canadienne sur les environnements alimentaires évalue généralement soit la structuration socioéconomique des environnements alimentaires ($n = 28$), soit les associations entre les environnements alimentaires au détail et le régime alimentaire, les données anthropométriques ou les résultats sanitaires ($n = 33$). Les autres articles présentent de la recherche méthodologique, des études qualitatives, de la recherche d'intervention et des commentaires critiques ($n = 27$). Les principales lacunes dans la littérature actuelle sont le manque d'uniformité des indicateurs choisis dans les études et le manque d'études longitudinales et d'études d'intervention.

CONCLUSION : Les environnements alimentaires au détail sont un sujet qui intéresse de plus en plus la recherche et l'élaboration des politiques et des programmes au Canada. Des méthodes uniformes (le cas échéant), des études longitudinales, de la recherche d'intervention et des partenariats étroits entre les chercheurs et les acteurs privilégiés feraient grandement progresser le domaine de la recherche sur les environnements alimentaires au détail au Canada.

MOTS CLÉS : nourriture; environnement; inégalité; Canada; revue de la littérature