



Policy Options for Healthier Food Environments in City-Regions: A Discussion Paper

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Purpose

The purpose of this discussion paper is to examine policy options to support healthy food environments within a public and population health context. For the purposes of this paper, a *healthy food environment* is defined as the availability, accessibility, and adequacy of food in a community or region. Within a given jurisdiction, this includes the overarching governance context for policy; the physical and spatial features of the built environment; and the social and cultural community context.

This discussion paper evaluates the evidence base and promising practices for city-regions in particular. The focus on cities is intended to address the re-emergence of interest in a “healthy cities” approach to policy and planning for urban food environments, which has manifested in a momentum among city-regions to be proactive and intentional about food issues. We are seeing an increasing array of innovations at the local level across Canada. This discussion paper is intended to offer supporting evidence to inform the development of those interventions.

This paper is not intended to provide a comprehensive knowledge synthesis of the scientific literature on all dimensions of the food environment or food systems. Rather, it focuses on highly relevant policy options that have been identified to be of interest to public health stakeholders by the authors of this paper and the National Collaborating Centre for Environmental Health. Moreover, it is worth noting that the state of the evidence in this area is still emerging. Many local authorities in Canada and elsewhere have begun to adopt interventions but have had limited or constrained capacity to carry out intervention research and outcome evaluations. It will be important for public health actors, and other stakeholders involved in these efforts, to continue to build the knowledge base as they test and adapt interventions in different contexts.

This paper begins with an overview of the current city-region food environment context in Canada, reviews the evidence on specific health outcomes that have been attributed to the current environment, and then explores the implications of this evidence for policy levers that local health units have at their disposal to promote healthier environments and environmental change.

This paper does not recommend or prioritize specific policy actions, nor does it specifically focus on the knowledge-to-action cycle in terms of implementation challenges and opportunities. We have used a health equity lens throughout the paper, but have not included the growing literature on food insecurity, defined at the household level as an inability to access food related to underlying economic constraints. Food insecurity has its own health consequences, but can also amplify food environment disparities and associated health outcomes in communities. Social policy and private sector, including charitable, interventions to address food insecurity are beyond the scope of this discussion paper.

Finally, it should be noted that the food environment is situated in a dynamic policy space dominated by large private sector players and federal and provincial regulators, with city-region stakeholders, including public health authorities, beginning to explore and assert their roles in the policy arena. This discussion paper highlights the opportunities for public health and city-regions within this broader system.

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Executive Summary

Food is a key contributor to well-being, but unhealthy eating habits are widely recognized as risks for disease and preventable early death. It is increasingly evident that the environments in which we live, shop, and eat are independently important in shaping food consumption beyond individual knowledge, preferences, and choices. There is also a growing understanding that the environments, within which our choices are made, generally do not support healthy eating and often directly promote foods high in salt, sugar, and fat.

Food environments are defined as the physical, spatial, and cultural spaces that determine the availability, accessibility, and adequacy of food in a community or region. Globally, it has been recognized that local authorities, including public health professionals and city-region governments, have essential roles and valuable levers to shape local food environments in ways that are more explicitly health-promoting.

This report is divided into two sections, with a focus on how population-level interventions to address the food environment can complement, enable, and optimize the reach and sustainability of individual and household level behaviour change. This report embeds a health equity lens, but household-level food insecurity specifically is beyond the scope of this report; Appendix A addresses this point in greater detail.

The first section presents a policy analysis of four typical cases of complex population health interventions for the food environment.

1. **Planning for Health**, focusing on the example of urban agriculture interventions and urban planning / land use policy instruments
2. **Transforming Urban Food Retail**, focusing on the example of healthy corner stores interventions and licensing policy instruments
3. **The Purchasing Power of Cities and Institutions**, focusing on the examples of institutional procurement interventions and food business incubators and fiscal instruments (food pricing/taxation is generally out of the scope of the discussion here but Appendix B addresses this in greater detail)

4. **A Culture of Transparency and Participation**, highlighting the examples of nutrition information labelling interventions in the eating-out environment (menu labelling) and food policy councils

The second section is a synthesis of the evidence of the relationship between food environment interventions and specific health outcomes of interest. We asked two knowledge synthesis questions.

1. **What is the relationship between food environment and diet or health outcomes?**

To address this question, we focused on the extensive and growing group of reviews that have been published on this topic since 2004 (three dozen, with twenty in the last five years). Our synthesis found that the Canadian literature does not provide good evidence for the presence of “food deserts,” traditionally defined, in Canada. There is, however, better evidence for “food swamps,” disadvantaged areas with a high concentration of sources of relatively more unhealthy foods. In terms of the impact of specific community and consumer nutrition environment features on diet and health outcomes, all reviews found mixed results, with some reviews finding stronger associations between geographic food access and outcomes than others. Gaps in and variations among methods of food environment measurement appear to have contributed to these equivocal findings.

Key findings:

- There is poor evidence for the presence of “food deserts” traditionally defined in Canada; a key problem is instead “food swamps,” geographic areas with a predominance of unhealthy food options.
- Geographic food access is the most frequently studied characteristic of the food environment.
- The evidence is weak on the dietary and health impacts of supermarkets, including opening new grocery stores in low-income areas; this finding is potentially related to the mixed (healthy and unhealthy) food offerings in this type of food retail outlet.

- The evidence appears to be stronger for improvements in diet and health outcomes for interventions to improve availability of healthy foods in small food stores.

Key methodological gaps:

- Wide variety in selection and use of food environment measures.
- Wide variety in outcome measures including dietary assessment methods that were not optimally robust; associations between food environments and diet were found to be stronger for studies that employed more robust dietary assessment methods.
- Most literature examines cross-sectional associations (rather than longitudinal).
- Few studies incorporate multiple environmental features (e.g., access, availability, and pricing) within the same study.
- Few studies incorporate social context for food environment interventions in the same study alongside outcome measurement (e.g., policy levers; construction of social meaning).

2. What is the evidence on the impact of zoning, urban agriculture or community gardens, food pricing, or healthy food retail, or their constituent components, on diet or health outcomes?

To address this question, we have included systematic reviews as well as recent original research. Again, the literature features gaps in terms of consistency of measurement as well as for specific policy interventions. For example, no systematic reviews have addressed zoning interventions. Small food stores (i.e., the “healthy corner store” intervention model) are the food retail setting in which the clearest beneficial effects on diets and health outcomes can be documented.

Key findings:

- No systematic reviews have examined the impact of food-related zoning on health outcomes.
- The evidence is weak for community gardens’ impact on food access. The evidence is mixed for gardening impacts on vegetable consumption or other dietary outcomes, including adult and child populations, and

stronger for mental and social health benefits.

- Population health interventions in food retail outlets are generally complex, encompassing information, promotion, availability, and pricing components, including associated community and store owner/operating training and engagement activities. Multi-component interventions including demand- and supply-side strategies appear to be more effective than targeted approaches. The evidence is limited for the effect of supermarket interventions on influencing consumer food purchasing behaviour; small food store interventions appear to be more promising in terms of effects on consumer purchasing and consumption.
- The key research gaps reflect high heterogeneity in the designs and methods used in food environment research to date. We also observed a major gap in research to evaluate risks and sustainability of interventions, including unintended effects.

Background

Food, diets, and food system change: a public health issue

Food is essential to human health and wellbeing.¹ What we eat on an individual and population basis is also a major contributor to ill health and preventable early death.² At least 1 in 5 deaths worldwide are now attributable to dietary causes along with physical inactivity³⁻⁵

The spread of high-output, intensive agricultural production methods and global food supply chains have transformed the way people acquire, prepare, and eat food, especially in cities.⁶⁻⁹ From the interwar period onward, global concerns about increasing food availability and basic nutritional adequacy prompted public policy and market shifts geared towards ever-increasing quantity and efficiency of food production, referred to as the emergence of the “productionist paradigm.”¹⁰ This landmark shift in food production in the 20th century accelerated a series of societal “transitions” characterized by changing population-level burdens of disease, and access to an abundance of cheap, energy-dense, and increasingly

nutrient-poor foods, referred to respectively as the epidemiologic transition and the “nutrition transition.”^{7,11}

In the last few decades, other unprecedented political and environmental challenges related to food have presented new threats to our collective wealth and health. Observers have increasingly focused on the global governance challenges around the right to food¹²; increasingly concentrated corporate power in food supply chains,^{13,14} food commodity price volatility, land use vulnerabilities, and conflict¹⁵; declining natural resources¹⁶; and climate change.^{17,18}

Since 2007, the majority of the world’s population is now living in urban environments.¹⁹ From a dietary standpoint, this has meant that people have become increasingly reliant on their ability to participate in economic structures around food. Most urban consumers no longer participate in primary production and processing activities and purchase what they eat, as end-user consumers in a vastly transformed food manufacturing and distribution arena.^{10,20} The global food supply is increasingly channelled through a narrow set of supermarket buying desks in the concentrated “middle” of the supply chain.²¹ Most urban food choices, particularly in high-income nations, are now largely constituted by experiences shopping in large supermarkets and eating away from home.²²⁻²⁴

In Canada, dietary risks comprise the largest burden of disease, expressed as a percentage of disability adjusted life years.²⁵ This includes poor quality diets characterized by low fruit and vegetable intake^{5,26-28}, excess energy-dense, nutrient poor foods high in fat, sugar, and sodium^{23,29,30}, and high intakes of what have been termed “ultra-processed” foods.³¹⁻³³ People who follow the recommendations in Canada’s *Food Guide to Healthy Eating* have a higher probability of meeting their nutrient requirements,³⁴ but only 0.5% of Canadians have been found to adhere to these.³⁰ The majority of Canadians eat fewer than the Guide’s recommended seven to ten servings of fruits and vegetables each day.^{23,29}

It is clear that public health actors have multiple imperatives to address food and diets. The presence of key structural drivers for dietary change, including systems-level economic and social conditions, suggests that structural solutions could also have a major impact. Policy interventions at the population level are one way to create the supportive

environments needed for dietary improvement, a core health promotion activity.³⁵ However, the current situation presents challenges for public health in terms of the complexity, magnitude, and pace of dietary and food systems change. For public health, acting upon food now means dealing with longstanding problems of food insecurity, nutritional status, and foodborne diseases, but also emergent risks and burdens around obesity, noncommunicable diseases, food production for urban contexts, environmental change, and food system sustainability.

Public health has begun to take up this challenge in substantive and innovative ways. For example, and as we will delve into in greater detail below, public health actors in Canada and the United States have adopted policy interventions to address geographic disparities in retail food access and promote novel food distribution mechanisms; reduce the presence of nutritional and foodborne disease risks in the food supply; promote food growing in urban environments; reinterpret urban and peri-urban zoning for improved use of land and space; embed a range of health considerations in regional food system plans; develop food, nutrition, and environment standards in schools and other public institutions; disclose accurate information about the content of food at the point of sale; limit youth exposure to unhealthy food marketing; broker interdisciplinary and cross-sectoral forms of cooperation; and enable citizen participation in food policy and planning through councils, roundtables, and community-based research.^{3,36-49}

This wide array of domains for public health intervention speaks to the growing breadth of health promotion and primary prevention activities envisioned as creating healthy and supportive food environments through healthy public policy.³⁵ But it also raises the essential idea that when it comes to addressing contemporary food problems, public health must cooperate with several relevant groups of policy actors whose influence, interests, and values might not always align. Public health must also deal with the situation that formal authority and power for food systems is often concentrated outside the control and mandates of the health sector. The powers to shape city-region food systems are often not in the hands of local governments whose formal roles, even with explicit city-region health mandates such as in the province of Ontario, still tend to be focused on “downstream” issues of food safety, health promotion, and waste collection.

Finally, the goal of health equity is foundational to public health policy and practice. This means that a key underlying motivation for public health to lead food interventions is to mitigate underlying social, economic, and spatial disparities; to promote a fair distribution of resources; and to enable individual capacities. It must be acknowledged that while the remainder of this report focuses on food environment policy interventions at the population level, in reality, these cannot be isolated from the economic constraints that individuals and households face in acquiring healthy food of good quality in socially appropriate ways, and in our diverse Canadian context, culturally acceptable foods as well. The latest data from the Canadian Community Health Survey indicates that 1.7 million households in Canada, or nearly 1 in 8, experienced food insecurity in 2012.⁵⁰ In the evidence review below, relevant literature on food access in low-income communities has been included in the analysis and discussion, as well as an examination of food pricing interventions. However, the problem of addressing adequate income at the individual and household level in the first place, and its direct and indirect effects on health, is beyond the scope of our analysis here (see Appendix A for extended discussion on this point).

A focus on food environments

In this discussion paper, we examine a specific subset of dietary and food system issues that can be viewed through the lens of the *food environment*. For the purposes of this paper, the *food environment* is defined as the availability, accessibility, and adequacy of food in a community or region.⁴² Within a given jurisdiction, this includes the overarching governance context for policy; the physical and spatial features of the built environment; and the social and cultural community context.

Food environments have been identified as a key predictor of people's ability to eat well, and consequently, have a substantial impact on overall population health and wellbeing. Moreover, food environments have been widely recognized as having a significant influence on diets and health status, over and above individual knowledge, preferences, and behaviours.⁵¹ Accordingly, food environments have become an important area for population health intervention research, although the vast majority of food environment interventions remain un- or under-evaluated. The application of food environment models has accelerated over the last decade, and a

series of recent systematic reviews have highlighted specific considerations about methodology and research gaps.^{42,51-66}

The obesity connection

First, the interest in food environments has been closely linked to the concept of the "obesogenic" environment and how it produces energy imbalance and poor dietary quality.^{67,68} The literature on obesogenic environments suggests a correlation between food environments and proximal health outcomes such as dietary attitudes and choices, as well as distal ones such as obesity measured in terms of body mass index. More recently, however, researchers and policymakers have begun to reframe food environment interventions to emphasize desirable public health outcomes at different scales of change, such as health at every size⁶⁹ and a just, healthy, and sustainable food system that encompasses food-friendly neighbourhoods, equitable food access, and reinvigoration of local economies.^{47,70,71}

The important role of local authorities

Second, the literature on food environment interventions has highlighted a special role for local authorities in shaping food environments, including city-region governments as well as health departments.^{25,44,72-74} This literature has suggested that local authorities could have more influence over food environments than many presume, given their traditional "downstream" jurisdictional roles in the food system.⁴⁷ Local health departments have gone far beyond risks associated with food consumption and waste to tackle "upstream" issues such as ecosystem management, land use, primary food production, and food distribution channels.

The emerging role of local authorities in shaping food environments has demonstrated that they can leverage legitimate institutional roles in promoting city-region well-being. Municipalities are also the order of government that can make the most of their relationship with citizens, engaging communities and civil society organizations to participate in environmental change. As Hancock and Duhl (1986)^{75(p15)} argued in one of the early "healthy cities" manifestos, relative to provincial or federal governments, city-region governments have been called "the closest level of government to people that have the mandate, the authority, and the administrative resources needed to bring together the

wide variety of skills and resources needed for a multi-sectoral approach to health.”

The resurgence of interest in healthy cities and communities as an organizing principle has motivated much local-level activity on food environments worldwide. The WHO Healthy Cities initiative and related health promotion movements originated in Canada in the mid-1980s, based on the concept of health as determined by structural factors—factors that exceed the boundaries of what biomedical advances alone can address. It suggested that health was not simply the absence of disease, but represented a holistic state of population-level and individual well-being, as well as the potential for flourishing. Healthy Cities highlighted the unique challenges—and opportunities—of the urban environment. Cities were where health disparities were increasingly evident, but were also a critical space for citizen-led social innovations. Since then, we have come to understand urban health as shaped by a range of determinants embedded in complex systems of reciprocal interactions requiring interdisciplinary and intersectoral action.^{45,76-78} Momentum has grown among public health practitioners, urban planners, and other actors at the local level to be proactive and intentional about food issues and consider health and food systems in community design.⁷⁹

The governance context for city-region food policy and planning

The “food” portfolio was historically used to refer to food security issues for a nation, such as during the interwar period. Currently, when city-region actors enact policies to address food environments, this can refer to legislative portfolios that include agricultural production, community development, culture, economic development and regulation, environment, finance, health and social care, nutrition, and others. Different jurisdictions handle the distribution of authority differently, and food environment interventions are often nested across multiple portfolios, orders of government, and other social structures, resulting in a need for what has been called “food systems thinking”³⁸ or in the ecosystem resilience literature, “adaptive governance”⁸⁰ to bridge intra- and inter-organizational, cross-jurisdictional, and cross-sectoral divides.

Since no order of government in Canada has complete authority over “food” per se, governments have often developed food environment interventions within the context of interpreting various formal mandates, such as core public health standards or regional official plans. In Canada’s federal parliamentary democracy, city-regions hold a range of powers that depend upon their relationships with the provinces, which hold constitutional authority over local matters. In other words, the function, finances, and governing structure of city-regions fall under provincial jurisdiction. In addition, the evolution of interpretations of constitutional authority in Canada has meant that federal and provincial-territorial governments have come to prominence at different times for different portfolios, reflecting dynamic, negotiated cycles of more “vertical” or more “horizontal” governance.

For example, provinces hold formal responsibility for health matters, but the federal government has often asserted its authority for specific health priorities through exercising spending power or moral authority in the name of national interest. In turn, city-regions and local health units have sometimes enacted innovative measures to address health issues where higher orders of government have been reticent or unable to proceed. Some of the emergent activity on local food environments, for example, has been concentrated in Ontario,^{49,61,81} the last province in Canada to maintain a relatively autonomous system of local public health units. This includes public health units that are health departments within city-region governments as well as freestanding agencies. In some instances, this has allowed provincial and federal governments to later draw upon these precedents to adopt legislation or programs that institutionalize and scale up these local innovations.

For the purposes of this report, food environment policy interventions also encompass public health policy of the “big P” and “small p” types.⁸² For example, “big P” policy activities would include adopting formal legislative changes such as food environment or food security provisions in zoning and licensing regulations. “Small p” policy activities would include civil society organizing around food, or adopting a food systems approach to public health food handler certification. “Small p” policy activities are sometimes referred to in the public policy literature as policy implemented within programs or “street-level” practice.

An ecological conceptual framework for food environments

The influence of urban planners, rural and cultural sociologists, and agricultural economists in the food systems and food environments literature means that there are a number of valuable interdisciplinary conceptual models that we can apply to the analysis of policy options for healthier food environments in city-regions. Discipline-specific terminology used to describe key characteristics of the food environment also varies.

For example, the “foodscapes” approach seeks to understand the human geography of varied encounters with food in our physical, social, and cultural contexts, and lived experiences.⁸³ Others have focused on the idea of the “built environment” applied to food. Frumkin et al. (2011)^{84(p5)} define the *environment* as “the external (or nongenetic) factors—physical, nutritional, social, behavioural, and others—that act on humans” and the *built environment* as the subset of “*settings* designed, created, and maintained by humans, such as buildings, neighbourhoods, and cities.” Both the built environment and foodscapes models have been influenced by the earlier “settings” approach to health promotion.⁸⁵⁻⁸⁷

The built environment has been identified by the NCCEH as a priority issue for environmental health practitioners. The concept of the built environment articulates how environmental influences on health are reciprocal: places influence people’s health; and people, in turn, adapt to and shape the places in which they live, work, play, learn, and age. Existing work on the built environment has focused on aspects such as walkability, active transportation, or air quality, but food is a major aspect of the urban built environment that has been relatively underexamined. In Canada, British Columbia has included healthy food systems as one of the five core features of a healthy built environment in its *Healthy Built Environment Linkages* toolkit, which describes key evidence gaps (see Figure 1).⁸⁸

The recent University College London (UCL)/*Lancet* Commission on Healthy Cities is another notable exception. In its exploration of the potential for shaping the urban environment to influence health, it offered a conceptual model for understanding the dynamic interrelationships between built environment features, interventions, urban planning, governance, and health outcomes and highlighted case studies of promising urban agriculture interventions in low-, middle-, and high-income nations.⁴⁵



Figure 1. Five core features of a healthy built environment (Source: Provincial Health Services Authority 2014,^{88(p15)} used with permission)

An ecological model of food environments

The most widely used conceptual model of food environment factors that incorporates the broad policy context, specific environmental components, and dietary outcomes in a parsimonious description remains the “community nutrition environments” model by Glanz et al. (2005)⁸⁹ (see Figure 2). This is the model that we focus on most closely in this report, and that we have used in previous related reports for Health Canada.⁴²

Based on a social-ecological model of public health, the community nutrition environments model is intended as a starting point for categorizing and thinking about environmental variables related to eating behaviours. It is valuable for understanding the general “logic” of potential influences on health outcomes but not necessarily *how* they relate to one another. The Glanz model incorporates constructs theoretically and empirically related to eating patterns from several academic fields, including public health, health psychology, consumer psychology, and urban planning, and is notable for distinguishing constructs that were previously aggregated in previous research. Glanz et al. (2005) characterizes food environments as comprised of four dimensions: the community nutrition environment; the consumer nutrition environment; the organizational nutrition environment; and the information environment.⁸⁹

Community nutrition environments are reflected in measures of food access such as the number and kinds of food outlets in people’s neighbourhoods. Community nutrition environment factors are sometimes referred to as geographic food access. Many methods of measuring geographic food access have emerged. For example, measuring the proximity of homes to grocery stores or fast food outlets, or counting the number of convenience stores within a specific geographic area are both measures of geographic food access.

Consumer nutrition environments are distinct; they represent characteristics of the food environment important to consumers who have already reached their food store or restaurant destinations (e.g., food availability, affordability, quality, and on-site barriers and facilitators to healthy eating), also roughly understood as the “consumer experience” dimension of food environments.

Glanz et al. also distinguished the broader information environment of media and marketing and the organizational nutritional environment, where food environment factors influencing health are structured within institutional settings. Finally, sociodemographic factors were seen as mediating and/or moderating the impact of food environment variables on eating patterns.

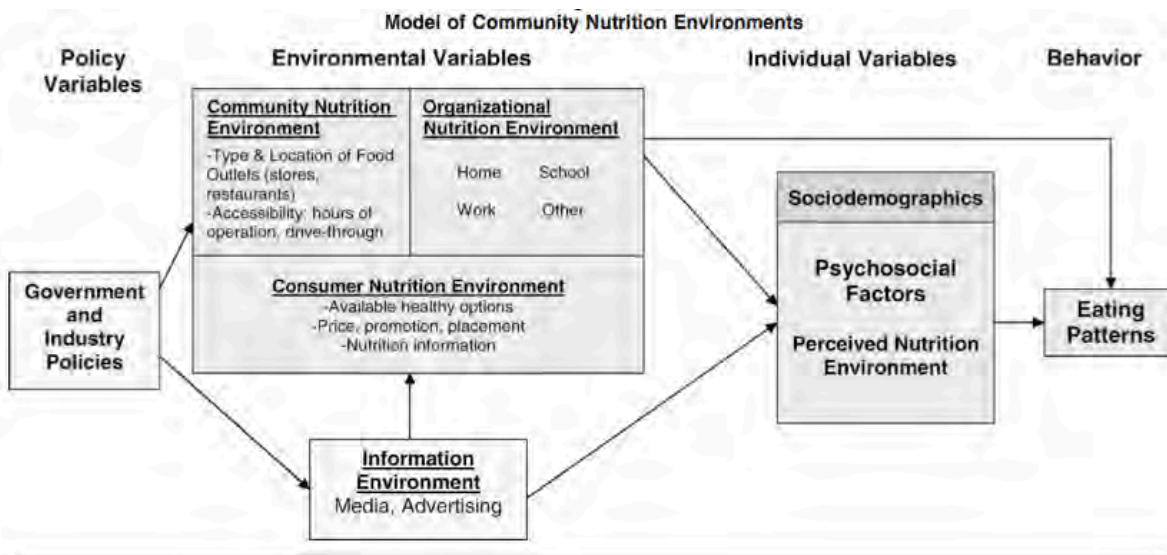


Figure 2. Social-ecological model for food environments (Source: Glanz et al. 2005,⁸⁹ used with permission.)

Policy Interventions for the Food Environment

Adopting the Glanz et al. (2005) food environment model as a starting point for our analysis of policy options highlights how the purpose of population-level interventions to address the food environment is to complement, enable, and optimize the reach and sustainability of individual and household level behaviour change.^{51,90-93}

Have and colleagues have defined *population health interventions* as “actions with a coherent objective to bring about and produce identifiable outcomes ... [including] policy, regulatory initiatives, single strategy projects or multi-component programmes” with the intended goal of improving the health of communities or populations.^{94(p119)} Working with partners at the Canadian Institutes of Health Research, they have offered guidance on how to appraise the evidence on complex interventions,⁹⁴ as well as intervention research design.^{95,96}

Given that the state of evaluative evidence on complex food environment interventions using a holistic, population health intervention research approach remains relatively scarce, in this discussion paper, we have taken the approach helpfully suggested by Petticrew (2011).⁹⁷ He uses the example of urban regeneration to illustrate how “simple” and “complex” lenses can actually be applied to the same problem. Urban regeneration interventions can be visualized as large packages made up of multiple component parts. Then, the evidence on effectiveness of the interventions can be separated into examining the effects of each of the components. This is the approach that we take in this discussion paper.

In this section of the report, we offer a policy analysis of four typical “cases” of complex population health interventions for the food environment: 1. Planning for Health; 2. Transforming Urban Food Retail; 3. The Purchasing Power of Cities and Institutions; and 4. A Culture of Transparency and Participation. Each case is comprised of an illustrative example of a complex intervention, and then analyzes how each is made up of constituent parts, including specific policy instruments and big P (e.g., legislation) and small p (e.g., reframing goals) policy elements.

In the next section of the report, we present a synthesis of the evidence of the relationship between

food environment interventions and specific health outcomes of interest.

In both sections, we attempt to strike a balance between describing relevant macro-social goals, meso-level jurisdictional issues, and fine-grained, micro detail, in order to offer public health practitioners a sense of the motivations for such interventions as well as their potential operationalization. We also convey how public health actors at the local level can play different roles in the design and implementation of interventions. Sometimes, they lay the groundwork for policies; in other cases, they might lead pilot interventions and evaluations, or establish programs and service delivery. Public health also often plays an entrepreneurial role, supporting evaluation, coordination, and facilitation; brokering relationships; and leveraging existing resources and funding to support innovative approaches.^{38,40}

Case 1. Planning for Health

Example: urban agriculture

Globally, a rich literature has arisen around the possibilities of urban planning for food production. As we noted earlier, the urbanization of human settlement patterns means that people have become increasingly distanced from primary production of food. However, in the last few decades, there has been a reinvigoration of interest in urban agriculture activities for the high-income nation context, although systematic evaluations of such activities are still rare.^{45,98} The interest in urban agriculture has been accompanied by initiatives on a broader scale to ensure that food and agricultural systems are planned in a “nutrition sensitive” way.⁹⁹

Our current understanding of agriculture in the urban context reflects three different policy aims for such activities: economic (intended for income or employment generation); social (as a means to achieve health and social ends); and ecological (to improve the urban ecosystem).^{98,100} As we will demonstrate in the next section of the report on evidence for health outcomes, the primary considerations in the public health evidence base on urban agriculture to date have been the social impacts. For example, we will describe some of the literature on physical and mental health outcomes of food growing activities, from research on community-based gardening. As the three policy aims indicate, however, the example of urban agriculture actually

raises a broader set of policy options for how environmental health professionals can intervene in the food environment in city-regions.

Environmental health practice related to urban agriculture requires a diverse skill set, from traditional risk assessment to community development and intersectoral engagement related to healthier built environments. For example, traditional environmental health roles include assessing unique risks of food production in urban settings, including environmental sanitation and foodborne illness pathogens, chemical pollutants and agricultural toxins, and heavy metal exposure from industrial contamination of soil, with consideration to greatly different scales of production, from home gardening to larger scale commercial activities. In terms of healthier built environments, local public health practitioners and inspectors have been called upon to assess and plan for the availability and use of agricultural land, and to consider how such plans intersect with other urban uses such as commercial activity, recreation, housing, and transportation.

Urban planning and land use policy instruments

The idea of public health becoming involved in land use planning has received steadily growing attention from a built environment standpoint, such as in the recent environmental scan by Perotta (2012)⁴³ for the Toronto Clean Air Partnership and the Ontario Public Health Association, and in the Healthy Built Environment Linkages initiative and toolkit led by the British Columbia Provincial Health Services Authority (2014).⁸⁸ The principle behind public health involvement in this set of policy instruments is supportive environments, meaning that public health actors can consult and prospectively review planning documents to ensure that the food environment and related impacts on health are considered in city-region growth and development. The *Healthy Built Environment Linkages* toolkit, for example, highlights how health evidence can be used to support and increase the value of planning principles in a way that optimizes health outcomes. For example, there is good quality evidence to support planning for environmentally sensitive areas to increase soil nutrient concentration, biodiversity, water quality, and ecosystem functioning for improved health, whereas there is less evidence on the health impacts of agricultural land use in urban and semi-urban settings. Both, however, are important planning principles that should be considered in planning for a

healthier natural environment in concert with a healthier local food system.

In Canada, provincial legislation mandates that municipalities must prepare official plans for growth, often called city or regional official plans.⁶¹ While city-region official plans must, at the very least, conform to overarching provincial legislation, for example, Ontario's *Planning Act* (1990),¹⁰¹ localities are welcome to go above and beyond provincial policy requirements, for example, by including considerations of food access into land use bylaws.¹⁰² In Waterloo Region, government actors, including public health practitioners and urban planners, were key players in working with a range of local stakeholders to reinterpret the regional official plan for improved food access and a healthier food system.^{49,103} The example of Waterloo Region illustrates how public health staff were especially important in: 1) linking food system factors through evidence and, over time, identifying and communicating relationships between trends in agricultural production, geographic access to healthier food, food insecurity, and healthier diets; 2) working in concert with planning officials to increase the legitimacy of food as a public policy concern; and 3) crafting permanent policy language that affirmed the ongoing roles of planners and public health officials in future regional planning.¹⁰³

In 2009, the Ministry of Municipal Affairs and Housing and the Ontario Professional Planners Institute (OPPI) released *Planning by Design: a Healthy Communities Handbook* that described how built environments could facilitate access to healthy food.⁷⁹ The handbook offered broad guidance on how land-use planning and urban design, incorporating long-term health and sustainability goals, could positively influence the well-being of diverse communities. It was also accompanied by a series of case studies on best practices in Canada and internationally. For example, the report highlighted the provincially funded Ontario Food Terminal, North America's fourth largest wholesale central distribution centre, as an ecologically sustainable and financially viable hub that enables direct linkages between producers and vendors.

In 2011, OPPI produced *Healthy Communities and Planning for Food: Planning for Food Systems in Ontario*, which described key principles in planning for healthy food environments⁷⁹:

- Using good planning principles to connect the planning needs of urban and rural communities and promote efficient, complementary land use systems
- Incorporating food systems into the framework of planning policies
- Including consideration for food systems in an integrated community sustainability plan, Official Plan, secondary plan, zoning by-law, and public health reports
- Understanding and connecting stakeholders and in multiple geographic regions to break down institutional barriers in addressing the impacts of planning policies on food systems

Beyond food growing, local authorities are finding other ways to use land use planning instruments to shape the food environment. Some jurisdictions have used zoning restrictions, for example, to reduce the presence of unhealthy food retail outlets and increase access to healthier options. The primary purpose of zoning is to prevent land uses that are thought to be harmful to neighbourhoods.¹⁰⁴ The call for public health professionals to re-engage in land development and community design has been fairly recent.¹⁰⁵ An increasing number of local communities have begun to experiment with different types of policy initiatives aimed at reducing or eliminating geographic disparities in access to food. Zoning laws can effectively restrict land use by limiting the number of fast food restaurants and/or promoting the development of healthier alternatives.¹⁰⁶ Chen and Florax (2010) have also noted how zoning laws can complement other policy proposals that work in retail environments, such as monetary incentives to existing food stores to stock healthy food items and the financial support and subsidization of farmers' markets and other venues to facilitate access to fresh fruits and vegetables.¹⁰⁶

In some cases, zoning restrictions have been used to accomplish other policy ends, but with unintended positive consequences for the food environment. For example, the development of new drive-thru windows was banned in Comox, British Columbia, because they were found to violate existing idling bylaws.¹⁰⁷ Another British Columbia town, Qualicum Beach, has prohibited private drive-thru establishments for decades, by defining what constituted a "restaurant" in a particular way, because "fast food restaurants" were originally seen as an aesthetic and cultural

direction in which the town did not want to go.^{107,108} City councillors in Saskatoon are currently considering a ban on drive-thrus because of traffic snarls caused by long drive-thru lineups.¹⁰⁹

The Coalition Québécoise Sur la Problématique du Poids (Quebec Coalition on Weight-Related Problems), a provincial advocacy group sponsored by the Association pour la Santé Publique du Québec, conducted a legal review of a number of countries where municipalities have used zoning regulations to change food environments.¹¹⁰ The report concluded that zoning regulations were both a legal and potentially effective way to improve food environments in Canada.¹¹⁰ Several American authors have also examined the legality of local governments using land-use tools, economic incentives, and local ordinances to increase residents' access to healthy foods or restrict their access to unhealthy foods,¹¹¹⁻¹¹³ and have found that zoning restrictions are generally upheld in US courts. In addition to restricting specific outlet types, legal scholars have argued that zoning laws can be used to create working definitions for particular types of food outlets that are more health-promoting, similar to what Qualicum Beach has done,¹¹² referring to the health promotion concept of using policy interventions to make healthy choices easy—meaning less costly, for both individuals and businesses.^{114,115}

Case 2. Transforming Urban Food Retail

Example: healthy corner stores

Convenience stores are one of North America's largest and most diverse retail sectors.¹¹⁶ A recent analysis by Agriculture and Agri-Food Canada (2010) suggested that to compensate for falling revenue due to decreased tobacco and fuel sales (currently about 60-70% of revenues), North American convenience stores are looking at tapping into the consumer market for high-quality, fresh produce in addition to the usual non-nutritious items, particularly for consumer segments that have less attachment to traditional methods of purchasing food such as weekly "big shops" at large supermarkets.¹¹⁶

This potentially viable market segment is also reflected in the growing array of start-up capital provided for "healthy corner stores" interventions undertaken in several United States jurisdictions.

Many are supported in addition through public funds, such as federal or state government healthy food financing initiatives, including those linked to the federal “Let’s Move” childhood obesity reduction initiative.¹¹⁷

What qualifies as a healthy corner store varies among stakeholders, although definitions often relate to the visual promotion of nutritious foods, increasing the availability and prominence of fruits and vegetables, and providing nutritious options at an affordable price. To the best of our knowledge, the pilot of a healthy corner store funded initiative that our team is leading for Toronto Public Health is the first government-led healthy corner store initiative in Canada, and is currently being evaluated with support from the Public Health Agency of Canada. The goal of these projects is to improve residents’ diet quality and food security by increasing the availability and affordability of nutritious foods in low-income neighbourhoods.

Healthy corner stores fall into the broader category of healthy food retail interventions. Most of the food retail interventions that have been evaluated have been conducted in the United States, but several jurisdictional examples have also emerged in Canada.⁴² Healthy food retail interventions can include introducing food retail where none currently exists (e.g., opening a grocery store in a low-income, underserved area) or changing existing food retail to encourage the purchasing and consumption of nutritious food, such as the healthy corner store approach.

Different policy levers can be used to encourage each of these types of retail interventions. For example, New York City’s FRESH (Food Retail Expansion to Support Health) program entails a collaboration between the city’s health, planning, and economic development departments to offer store owners and developers both zoning incentives (development rights, reduction in parking requirements) and financial incentives (real estate tax reductions, sales tax exemptions for facilities renovations) to promote grocery store retention and development in underserved neighbourhoods.¹¹⁸ Another type of healthy food retail intervention is the mobile vending model, which includes activities such as New York’s green carts, Toronto’s Mobile Good Food Market, and Chicago’s Fresh Moves bus as variations of “mobile” options to expand retail availability of fresh produce in underserved neighbourhoods.^{119,120}

In Minaker’s (2013) report for Health Canada, she documented the most common types of changes within a “healthy corner store” type conversion: point of purchase information programs (including displays of print material, electronic media, grocery store tours, taste tests, and cooking demonstrations, sometimes with a registered dietitian); economic incentives for purchasing nutritious foods through price reductions and coupons; and increased stocking of nutritious items.⁴² Effective programs tend to be those that are based on a behaviour change theory (meaning that a full spectrum of environmental influences on behaviour is taken into account, as well as the potential for local variations in the way different contexts influence individuals); are of sufficient duration to establish the presence of change; include take-away reminders for home use; are based on clear goals and objectives; use highly visible, targeted messages in information and promotional material; and are multi-faceted. The sustainability of food retail programs depends upon capacity building and financial feasibility. For example, changing a traditional corner store to a “healthy food retail” model potentially requires small entrepreneurs to invest in major infrastructure modifications such as display shelving and refrigeration units, store reorganization, and novel process flows, to be able to provide perishable, nutritious foods (e.g., fruits and vegetables). In addition, store owners selling perishable items are required to have food handling certification, which requires additional training and cost to the store owners. Finally, procuring perishable, nutritious foods and selling them at a reasonable cost may be perceived as a barrier to owners and operators who may lack capacity (e.g., a truck) to procure foods at a wholesale price.

In Canada, several examples of healthy food retail programs exist at the city-region level, although most have taken place at a provincial or federal level. For example, the Zhiwaapenewin Akino’Maagewin program in First Nations communities in Northwest Ontario evaluated a comprehensive diabetes prevention program.^{121,122} One of the arms of the multicomponent intervention was to improve availability and affordability of nutritious foods in local stores, which complemented the other intervention components, including a school curriculum intervention.⁴²

In Saskatoon, the Good Food Junction, a cooperatively owned full-range grocery store in a low-income, under-served neighbourhood opened in

2012.¹²³ The Good Food Junction is a social enterprise aiming to provide good food at fair prices to core neighbourhood residents while increasing community-based economic and social development.¹²³ An evaluation of the impact of Good Food Junction on core neighbourhood residents' dietary outcomes is currently underway.¹²⁴

Licensing policy instruments

City-regions have retained the authority to administer and enforce a wide range of licenses and permits related to food activities, which can have a substantial influence on shaping the food environment. This includes licensing all types of food service establishments (e.g., restaurants, food takeout, mobile refreshment vehicles), food retail (e.g., supermarkets, convenience stores, bakeries, butcher shops) and permits for community or allotment gardens, access to City parks for food events, farmers' markets, community markets, and more. Generally, licensing authorities have not been proactive in leveraging their roles toward goals of health, equity, or sustainability.

Licensing can be a powerful tool to influence the quality of food establishments in an area. However, the experience of a high profile initiative from Toronto, the A La Cart program, demonstrates the substantial risks of trying to tie health or social development goals to an entrepreneurial model without addressing the silos and potential rigidity of intra-governmental structures. The A La Cart program was designed to introduce street-level carts that serve culturally diverse and healthy foods. Previously, vendors were limited to selling only pre-cooked wieners / hot dogs. However, the new licensing framework and the process of implementing the program were too restrictive and did not allow entrepreneurs to adapt their operations as any new, high risk venture is required to do to succeed.¹²⁵ Others have argued how the program suffered from a case of "too many cooks," each with their own expectations.¹²⁶ This sheds light on the reality that when public health actors attempt to adapt food retail interventions, they do so in a highly competitive, challenging market environment. The lesson learned was that it is difficult for governments to support innovative and creative economic development without embracing a more flexible, collaborative way of operating themselves. Moreover, for environmental health and other public health practitioners, such interventions require integrating a broader "systems" view of food into existing public health goals, financial resources, and inspection practices.¹²⁷

In the US, Minneapolis took a different approach in passing their 2008 Staple Foods Ordinance.¹²⁸ It requires that all stores stock a minimum of "staple foods" as a way to expand access to healthier foods but also reduce crime by reducing the presence of convenience stores that sell only alcohol and tobacco. While the city's inspectors have the power to fine stores that do not comply, they have found that the more effective approach is to work with storeowners to provide a broad range of supports to achieve compliance. The Minneapolis Department of Health and Family Support has stepped in to support the project by collaborating with partners to offer information and training related to procurement, marketing, community outreach, and business planning.¹²⁹

Healthy food retail interventions therefore offer unique policy opportunities for city-regions and local public health practitioners, particularly in terms of integrating diverse policy aims.¹³⁰ Similar to public health professionals' work in other areas of public health, such as food safety inspection, they offer a chance to integrate public health aims with local economic development, a range of food business owners and operators, business associations, and local community development groups.

In terms of equity, existing healthy food retail interventions have generally targeted low-income communities. In Canada, while there is little evidence for the existence of widespread *food deserts* (low-income areas where sources of nutritious foods are unavailable), there is good evidence for the existence of widespread *food swamps* (low-income areas where sources of unhealthy foods are plentiful).⁴² The distinction between "food desert" and "food swamp" is an important one for policy because each suggests a different set of relevant policy and program options. For example, a feasible solution for food deserts would be to create incentives for grocery stores to open in underserved areas. On the other hand, a feasible solution for food swamps would be to enact zoning bylaws to restrict the number of fast food outlets or convenience stores in a given area or to change the mix of products available in convenience stores through programs aimed at marketing healthy foods in such stores.

Moreover, as income decreases, price increasingly becomes the most important factor influencing purchasing decisions.^{131,132} Whether food is "affordable" within a food environment context is comprised of several factors including the pricing of

the food itself; whether food costs vary by neighbourhood; and the relative cost of nutrient dense (versus energy dense) foods.⁴² In the US, others have suggested that physical proximity of supermarkets may be a poorer predictor of obesity than price stratification of supermarkets, when considering geographic areas where shopping by car is predominant.¹³³ These factors are in addition to purchasing power—and income security—at the household level. Healthy food retail interventions may thus be a way to mitigate the geographic amplification of income disparities, but pricing components should routinely be considered as part of a comprehensive intervention.

Case 3. The Purchasing Power of Cities and Institutions

Example: institutional procurement

Existing food environment initiatives in organizations and institutions, including health institutions, have largely focused on shaping population health through the nutritional quality of foods served. For example, school nutrition policies, generally based on the comprehensive school health model, have been elaborated in many jurisdictions across Canada. While all current provincial policies address nutrition standards, few deal with other key population health goals, including health and nutrition education; health services and counselling; family and community outreach; and the food environment.¹³⁴ But the emerging literature on food environments and food systems, particularly in Europe, has highlighted another valuable opportunity for policy in institutional settings.⁸

Every year, city-run agencies, such as shelters, seniors' homes, and community health centres, procure a large amount of food. These food costs can run into the millions in larger cities and have the potential to incentivize shifts toward local, sustainable, and healthier food production. For example, an analysis of City- and community-led agencies in Toronto found annual food spending reached \$29 million.¹³⁵ Many cities have adopted procurement policies that prioritize economic or environmental considerations that typically take the form of a local food procurement policy. Many others have also adopted internal healthy food purchasing guidelines that, for example, prohibit staff from purchasing bottled water for City meetings or events. In Vancouver, the Vancouver Convention and

Exhibition Centre has been identified as a public institution that has prioritized local purchasing,¹³⁶ and successes in the postsecondary education sector have highlighted the possibilities for increasing local food procurement in primary/secondary school districts, through alignments with sustainability and climate change strategic goals.¹³⁷

Example: food business incubators

A standard priority for City and regional governments today is to promote economic development. Traditionally, this has focused on attracting large manufacturing or corporate entities. Over the last decade, there has been increasing interest in supporting the financing and development of entrepreneurial ventures that incorporate social and/or environmental aims.

A good example of food-related “social enterprise” or “social innovation” that cities have supported is the food business incubator. Incubators are physical spaces where new entrepreneurs can rent low-cost commercial kitchen space to grow their business. Often, and in the most successful cases, business supports such as marketing and investment advice are also offered to tenants. Typically, local governments in Canada have been less active in providing support to small-scale entrepreneurs in comparison to the US. In New York, the City has contracts with multiple agencies to run food business incubators in City-owned facilities. The Hot Bread Kitchen Incubates initiative supports the growth of start-up food businesses by offering licensed commercial kitchen space and business development, with a focus on newcomer women.¹³⁸ The Hot Bread Kitchen itself is a non-profit social enterprise that sells multi-ethnic breads to retailers across the city and uses that revenue to fund the incubator space and supports.¹³⁹ Local government facilitated the process by supplying the space, capital for renovations, and low rental payments.

Fiscal instruments

The examples of institutional procurement and food business incubators demonstrate how food environment change can be promoted through public sector instruments that use purchasing power as well as private sector, “social value” models. The corresponding role of local authorities and public health professionals can be to leverage existing policy instruments, or to use their nodal authority within the public sector to play a social innovation or broker role.¹⁴⁰

For example, procurement policies can be used in low or high impact ways. In other words, they can be symbolic ways to support change that does not require high engagement from city-region staff or an investment of resources. It can be argued that the City of Toronto's 2011 local food procurement policy fits in this category. Its language calls for City food purchasing to embrace the objective of increasing the percentage of food that is grown locally, but only "when all factors, including costs, quality and availability are equal."¹⁴¹ More influential approaches to leveraging institutional procurement often requires added resources in the form of money to cover initial higher costs of food and capacity building to help reorganize procurement practices for staff and their vendors.

Social finance refers to funding that seeks to stimulate positive social and environmental returns for investors and society in general. It often goes by different names, for example, community investing, microfinance, social enterprise investing, or impact investing.¹⁴² Toronto Public Health, with support from the Public Health Agency of Canada, is exploring the range of social financing models to identify opportunities to leverage the flow of private capital into healthy food access initiatives. Foundations and other non-governmental organizations are already involved in a variety of social financing ventures, though only a few are specific to food. For example, Carrot Cache is a Toronto-based loan fund that provides grants and loans to local food ventures such as rooftop gardens. The Youth Social Innovation Capital Fund invests in young social entrepreneurs and started with an urban agriculture business, Fresh City Farms. Across the US, the Slow Money movement has been organizing investors to channel funding to small food enterprises and local food system initiatives through local investment funds. Recently, the J. W. McConnell Family Foundation (2013) initiated a new stream of social funding for demonstration projects to improve food in public institutions through new supply chain partnerships.¹⁴³

Traditional fiscal instruments such as taxation have also been proposed as having potential to increase consumption of healthier foods and decrease consumption of items such as sugar-sweetened beverages. Moreover, such instruments have the potential to generate general revenue for governments, which could be applied to health and social priorities. Fiscal autonomy in terms of taxation instruments at the municipal level varies widely among jurisdictions, and is a function of the authority

granted to them by higher orders of government. In November 2014, Berkeley, California, was the first municipal jurisdiction in North America to adopt a tax on sugar-sweetened beverages. We discuss taxation instruments in greater detail in Appendix B, including an overview of economic issues related to price elasticity for consumer goods.

Case 4. A Culture of Transparency and Participation

Example: menu labelling

Traditional approaches to health behaviour change have focused on shifting individual knowledge and attitudes around food. Increasingly, ecological and systems approaches to food choice have examined how information conveyed in an information environment can influence behaviour. For example, the issue of food and beverage advertising to children has received global attention in terms of how advertising has adverse effects on food knowledge, consumption, and health status, including obesity, with associated recommendations on how policy interventions can shift the advertising environment to be more health promoting.¹⁴⁴⁻¹⁴⁶

Public health actors have taken a proactive approach to the information environment in the area of nutrition information. Menu labelling interventions, where nutrition information is provided directly to consumers at the point of sale, are an extension of the logic of nutrition labelling to the eating out environment³⁹ given that people are eating away from home more than ever before.²³ Menu labelling can also be regarded as a direct translation of the government's role in ensuring information transparency in markets.³⁹ Well-described environmental barriers to healthier choices when eating out include large portion sizes,¹⁴⁷⁻¹⁵⁰ misleading health claims,¹⁴⁸ and nutrition information that is hard to access.¹⁵¹ For several years, the majority of interventions were voluntary, but health evidence on menu labelling continues to grow as jurisdictions test and adopt public policy interventions, notably federal legislation in the US and recent proposed legislation for Ontario for larger chain restaurant outlets. To date, there is good evidence that menu labeling makes nutrition information more visible in eating out environments, that it helps people to factor in nutrient content into decision making, and that the majority of the public is supportive of menu labeling policy interventions.³⁹

Jurisdictions in Canada have approached menu labelling differently, in some ways related to the different roles for nutrition and health inspection staff in local health units. For example, in 2010, the BC provincial government initiated a voluntary program to increase availability of nutrition in small and larger restaurants in a standardized format, although not on the menu itself, in partnership with food industry and civil society organization partners. BC Informed Dining has subsequently been endorsed at the national level by the Canadian Restaurant and Foodservices Association. In 2013, Toronto proposed a municipal menu labelling bylaw for larger chains—recently put on hold in light of provincial legislation going ahead—in addition to a public information campaign and a pilot program for nutrition information disclosure for smaller independent restaurants. Toronto’s menu labelling program drew from its strengths in environmental health protection and promoting private sector information transparency as a way to support a green economy as well as a “community right-to know,” such as in its food safety inspection public disclosure system (DineSafe) and environmental toxin reporting and disclosure.³⁹

Example: food policy councils and roundtables

The other important dimension of information transparency that has been a highlight of city-region activity on food environments is the notion of enabling food citizenship. This concept draws on the associated idea of “food democracy” as “demand for greater access and collective benefit from the food system.”¹⁵² One way of operationalizing this set of principles is for city-regions to establish and support deliberative spaces where different sectors and disciplines can interact to identify local issues of policy importance, such as through food policy councils and other types of relatively permanent citizen roundtables.^{81,103,153,154} While the organizational structure for food policy councils differs among jurisdictions, where public health has been involved, it tends to be an enabling force in such activity, such as offering dedicated staff time in support of council activity or acting as a convener between the citizen group and local decision makers.³⁸

Evidence on Food Environment Interventions and Health Outcomes

In the previous section, we used a policy analytic approach to establish how policy interventions for healthier food environments actually describe complex population health interventions, made up of several component parts. In order to take best advantage of the emerging state of the literature on effectiveness of such interventions, in this section, we have isolated specific interventions subcomponents to document the evidence on specific health outcomes.

Methods for evidence synthesis

We searched the academic literature based on two overarching questions. First, ***what is the relationship between food environment and diet or health outcomes?*** At least three dozen systematic reviews examining food environments and associated health outcomes have been published since 1990. To minimize duplication and present the best available evidence in this area, we have only included published systematic reviews to answer the first question. The second question is, ***what is the evidence on the impact of zoning, urban agriculture or community gardens, food pricing, or healthy food retail, or their constituent components, on diet or health outcomes?*** To address this question, we have included systematic reviews as well as recent original research that examined the impact of these policy interventions on a specific health outcome of interest.

The search engines Scopus, Web of Science, and PubMed were used in gathering articles. Keywords were tailored to each specific outcome of interest and are reproduced below. Relevant articles published in English from 1995 up to and including 2014 were selected.

Search strings

Food

Environment OR retail* OR neighbourhood OR neighborhood
 Nutrition OR diet OR eat* OR fruit OR vegetable OR obesogenic OR overweight OR weight OR obes* OR health OR cardiovascular OR cancer OR mental health
 Impact of zoning, urban agriculture, community gardens, food pricing, healthy food retail on diet or health outcomes

Food

Environment OR retail* OR neighbourhood OR neighborhood
 Nutrition OR diet OR eat* OR fruit OR vegetable OR obesogenic OR overweight OR weight OR obes* OR health OR cardiovascular OR cancer OR mental health
 Zoning OR urban agricultur* OR community garden* OR store OR food retail OR pric*

Results: Objective 1

Database	Hits	After Title Scan	After Abstract Scan
Scopus	139	42	14
Medline	83	29	9
Web of Science	105	52	26
			11 Overlap
			36 TOTAL

Results: Objective 2 – Pricing reviews

Database	Hits	After Title Scan	After Abstract Scan
Scopus	79	15	8
Medline	28	9	8
Web of Science	67	11	7
			7 Overlap
			12 TOTAL

Results: Objective 2 – Urban agriculture

Database	Hits	After Title Scan	After Abstract Scan
Scopus	242	21	8
Medline	18	5	3
Web of Science	14	6	4
			3 Overlap
			15 TOTAL

Results: Objective 2 – Food retail

Database	Hits	After Title Scan	After Abstract Scan
Scopus	69	5	2
Medline	421	11	8
Web of Science	222	5	4
			3 Overlap
			10 TOTAL

Results: Objective 2 – Zoning

Database	Hits	After Title Scan	After Abstract Scan
Scopus	35	13	8
Medline	18	2	1
Web of Science	78	3	0
			2 Overlap
			8 TOTAL

Objective 1: Influence of food environments on health outcomes

We examined three specific features of the food environment and their relationship to health outcomes. Within the *community nutrition environment*, we looked at geographic food access, which is measured according to a variety of indicators. Within the *consumer nutrition environment*, we looked at food availability and food affordability. Food availability refers to the foods that are available within outlets in a given geographic area. Food affordability refers to the cost (either absolute or relative) of specific foods within a defined area. Food availability can be measured through inventory-type measures such as the well-documented Nutrition Environment Measures Survey, which has been adapted to settings such as stores (NEMS-S) or restaurants (NEMS-R)^{89,155} or through shelf-space measures aimed at assessing the amount of shelf-space dedicated to various items.^{42,156} An example of an absolute measure of food affordability within an area is the National Nutritious Food Basket, which assesses the cost of a nutritious diet in various cities and is a standard public health indicator. An example of a relative measure of food affordability examines the cost of particular items *relative to* more nutritious options

(e.g., the cost of white bread relative to the cost of whole grain bread, or the cost of high-sugar cereal relative to lower-sugar options). Absolute measures of food affordability can be useful for practitioners to contextualize the cost of a healthy diet in their areas relative to social assistance or disability benefits, for example. On the other hand, relative measures of food affordability can be useful in describing what kinds of pricing prompts consumers' experience in various food outlets or communities.

The following discussion summarizes key findings from 36 literature reviews published since 2004, 20 of which were published in the last five years. Seven of the literature reviews assessed disparities in access to healthy or unhealthy food.^{52,66,157-161} Twenty-five reviews assessed associations between food environment features or interventions with dietary and/or health outcomes.^{53-60,65,162-177} Four assessed both disparities and associated health outcomes.^{51,52,178,179}

Geographic food access is the most frequently studied characteristic of the food environment. In part, this is likely because collecting geographic food access data is less resource- and time-intensive than other measures. Disparities in geographic food access have been addressed by ten published literature reviews to date.^{51,52,66,157-160,178-180}

Examining disparities in access to grocery stores and other sources of healthy foods based on area-level socioeconomic factors has been termed “food desert” research. Although definitions vary, food deserts are considered socioeconomically depressed areas with inadequate access to sources of healthy food. There is support for the notion of “food deserts” existing in the US.^{51,157,158,160,161,180}

Reviews of Canadian literature, however, suggest that food deserts are few and far between.^{42,157} However, as we have described above, “food swamps,” disadvantaged areas with a high prevalence of sources of unhealthy foods (e.g., convenience stores and fast food outlets) are plentiful. Of the few studies that have evaluated the diet- or health-related outcomes of opening grocery stores in low-income, underserved areas, only one has found improvements in diet.¹⁸¹ All others found no effect on residents’ dietary outcomes¹⁸²⁻¹⁸⁵ or food security.¹⁸⁵ In contrast, nine of 10 reviewed studies found significant improvements in diet or health outcomes for healthy food retail interventions to improve the availability of healthy foods in small food stores that typically represent sources of unhealthy foods.¹⁶⁷

In terms of the impact of specific community and consumer nutrition environment features on diet and health outcomes, all reviews found mixed results, with some reviews finding stronger associations between geographic food access and outcomes^{56,169,176} than others.^{53-55,57,59,60,65,164,168,171,173-175} In terms of supermarket access, one review found both positive and negative dietary effects due to the fact that supermarkets sell both healthy and unhealthy options. For example, although supermarkets can increase the diversity of available and accessible food options, they can also reduce the ability of marginalised populations to purchase a high-quality diet and can encourage consumption of energy-dense, nutrient poor, highly processed foods.¹⁶⁸

Several gaps noted in the literature have contributed to the inconsistency in findings and mixed results. First, inconsistent results are in part a function of the inconsistencies in the ways food environments are measured—a methodological flaw noted in 20 of the reviews. More nuanced, comprehensive measures of the food environment (i.e., measures of the consumer nutrition environment) would be a valuable contribution to the literature.⁵⁴ Second, inconsistent outcome measures contributed to the inconsistent

findings (a gap noted in 17 of the reviews). Interestingly, associations between food environments and diet were found to be stronger for studies that employed more robust dietary assessment methods.⁵⁸

Third, the vast majority of the literature has examined cross-sectional associations between aspects of the food environment and diet-related outcomes (a limitation noted by 18 of the reviews). One of the major issues with cross-sectional research, in addition to the inability to detect causal relationships, is self-selection bias, which was a limitation of the current body of research mentioned in three reviews). For example, associations between features of the food environment and diet-related outcomes may be due to individuals’ self-selecting their neighbourhoods to be closer to (or further from) particular types of food outlets that may impact diet or health, rather than an effect exerted by the food environment on individuals. Recently, longitudinal studies have begun to examine food environment exposure and dietary outcomes over time, but none of these studies has used measures of the consumer nutrition environment, and all have found limited (or no) effects of the food environment on the diet or weight of residents.¹⁸⁶⁻¹⁹¹

Fourth, very few studies include multiple environmental features within the same study to examine the relative impact of geographic food access versus food availability or affordability (a gap noted by 12 of the reviews). Fifth, few studies have conducted a policy assessment of various municipal policies that affect food environment characteristics (mentioned by three of the reviews). Assessing how policies affect the food environment is crucial to understanding how to create and sustain food environments that are supportive of residents’ healthy diets.

Finally, seven reviews noted the lack of social measures employed in the majority of food environment research. Social measures are important to understand the meaning that residents give to various food outlets and embed the objective food environment measures within the broader context of how and why individuals interact with their surroundings to procure food.

Objective 2: Influence of specific interventions or components on health outcomes

Zoning

Of the 8 reviews deemed relevant after an abstract scan, none were relevant upon reading. No systematic reviews to date have examined the impact of food-related zoning laws and health outcomes. One of the key challenges in implementing and evaluating zoning laws is how to identify geographical target areas. This is particularly challenging in city-regions, given that many local public health departments do not have good longitudinal small-area estimates of their population's health.¹⁰⁶ As described earlier, public health professionals should work with existing public health information and also develop new surveillance, research, and evaluation data to present a population level picture of health to planning boards and city-region government.

Gardening

To date, nine systematic reviews have assessed links between human health and urban agriculture interventions. As described earlier, these have generally focused on a fairly narrow range of community-based gardening activities designed for social purposes. Health outcomes associated with gardening were assessed in eight of the nine reviews; one review assessed the health impacts of raising chickens in urban backyards.

Eight reviews assessed the link between gardening and at least one health-related outcome. Two reviews examined the impact of gardening on diet-related outcomes of children and youth.^{192,193} Four reviews examined the impact of gardening on adults' diets,^{59,194} including one on mental health¹⁹⁵ and one on broad well-being.¹⁹⁶ Two reviews examined the impact of food growing on youth and adults, including nutrition outcomes from home and commercial production¹⁹⁷ and diverse impacts from community gardening.¹⁹⁸ Notably, authors of the single review assessing the impact of community gardens on food access and availability found minimal impact due to limited seasonal accessibility and low produce yield.¹⁹⁹

Food access

As described above, the food environment literature has identified geographic disparities in access to

healthy foods. While community gardens have been identified as one potential mechanism for improving the "mix" of foods available, particularly in low-income communities,¹⁹⁴ this assumption has not been borne out by literature to date. Indeed community gardens have been found to have a limited impact on community food access.¹⁹⁹

Dietary and nutrition outcomes

The most commonly assessed nutrition outcome examined in gardening studies was fruit and vegetable intake. At least 75% of studies in all four reviews assessing associations between gardening and fruit and vegetable consumption found significant associations.^{59,192-194} In the only meta-analysis of gardening, the most robust finding that emerged was that gardening increases vegetable consumption in children. This is striking, given that the effect of nutrition education programs—often associated with gardening—was found to be marginal or non-significant.¹⁹² Both systematic reviews that assessed other dietary indicators (e.g., energy intake, macronutrient or micronutrient intake) found that the majority of the literature supported an association between food growing and healthier diets.^{194,197}

Assessments of the effect of gardening programs on children and youths' food-related knowledge, attitudes and preference have shown mixed results; only eight of 11 studies in the Robinson-O'Brien (2009)¹⁹³ review demonstrated improvements among gardening participants. In contrast, gardening was significantly associated with improvements in knowledge, attitudes, or preferences among adults in both reviewed studies.¹⁹⁴

Community gardens have recently been framed as obesity prevention. Only one review of food growing activities has included body weight, biochemical nutrition indicators, and morbidity as outcomes of interest, and this was in an international development context.¹⁹⁷ In this review, three out of five studies showed that vegetable/home gardening was associated with lower weight (one study found no difference and one study found that gardening was associated with higher weight). The same review found that vegetable/home gardening was associated with improvements in biochemical markers in three out of six studies, no difference in two of six studies, and worse biochemical results (e.g., serum retinol or iron) in one of six studies. Two of two studies examining the association between gardening and

morbidity found that gardening was associated with less morbidity.

Mental and social health

Three reviews assessed associations between gardening and mental or social health and well-being. One review examined the impact of gardening interventions on mental health among adults and found that of 10 studies examining mental health impacts of gardening interventions, all found beneficial effects.¹⁹⁵ Reported benefits included reductions in depression symptoms and anxiety, increase in attentional capacity, and self-esteem. In addition, reduced stress and improved mood resulted from patients' participation in gardening interventions. Two reviews found social benefits of gardening interventions included the development of a social network, improved social skills, and vocational benefits.^{195,196} In particular, among participants with mental health challenges, improved sleep, physical health, and spiritual benefits (e.g., feeling more connected to nature) resulted from participation in gardening.

Gardens have been identified as a social agent of change for historically marginalized groups, including low-income people and people with mental health challenges.^{195,196} In a review of 89 studies, 71 studied community gardens set in low-income areas.¹⁹⁸ One of the primary motivations of gardeners, managers, and others was to product fresh foods in a context of social interaction, community building, and welfare. The same review found that community gardens have been found to provide social benefits in 33 studies, economic benefits in 15 studies, health benefits in 14 studies, and a variety of other benefits in a number of other studies (e.g., reduced crime, education, environmental sustainability, environmental equity).¹⁹⁸

The feasibility of community gardening programs depends on the regional climate, which determines growing seasons and produce availability and variety. Few studies to date have assessed program sustainability and feasibility, although linking gardens with school subjects and learning outcomes has been proposed as one way to increase sustainability.¹⁹³ Some of the challenges of gardening interventions include clients struggling to meet physical and social demands, inclement weather, and payment dilemmas.¹⁹⁵ In much of the gardening literature to date, the assumption is that gardening interventions will result in sustainable nutrition benefits, especially

if they strengthen financial capital. However, the state of the literature is inadequate to substantiate this assumption.²⁰⁰

Gaps in the literature exist. By and large, few longitudinal studies exist^{193,194}; dietary assessments are inconsistent and of low quality^{59,193,194}; serious study design limitations exist, such as small sample sizes, convenience samples, and lack of control groups.¹⁹³ In most studies, gardening interventions are tied to nutrition education, rendering it difficult or impossible to tease out the individual effects of the food growing activities.¹⁹⁷

To support the development of community gardens, the evidence suggests that public health practitioners can connect with existing community garden managers and other key stakeholders (e.g., clinicians who work with patients with mental health challenges) to increase awareness about the existence of such gardens. In particular, the social effects of gardens appear to be reasonably well defined. There have been calls for gardening interventions to be more formally built into the health and social care referral system, which would increase awareness of and access to gardening interventions.¹⁹⁵

Backyard Hen Keeping

A number of jurisdictions in Canada have addressed the issue of backyard hen keeping in the urban environment. A review of this activity, particularly the discussion around infectious diseases risks, is beyond the scope of this paper. As far as we know, no formal risk assessments have been conducted in jurisdictions permitting backyard hens. Nonetheless, available literature (including evidence from developing countries and experiences from commercial poultry farming), expert opinion, and the recent policy experiences of comparable jurisdictions indicate that backyard hen keeping can have public health risks and benefits. A review by Pollock et al. (2012) for the British Columbia Centre for Disease Control noted that some have argued that municipal allowance of backyard poultry will improve health through human-animal bonds and feelings of autonomy over food selection.²⁰¹ Others have argued that these potential benefits are outweighed by the risk of pathogen transmission acquired through rearing practices or consumption of eggs, inappropriate waste management, interaction with pests and predators, nuisance factors (e.g., noise and odour), and animal welfare concerns, although public adherence to proper hygiene and animal

husbandry can significantly mitigate the risk of disease acquisition.

It is worth identifying that backyard hen keeping has been a highly contested domain of urban agriculture—and relatively marginal, in terms of reach—although it, too, raises valuable discussions about food environment-relevant policy instruments such as licensing, zoning, food safety, and other unique opportunities for public health professionals to have a substantive part in addressing food production issues in urban environments.

Information, Promotion, Availability, and Pricing Components of Healthy Food Retail

As described above in the policy cases, population health interventions in food retail outlets are generally complex interventions with multiple components, including community and consumer environment changes. The most commonly described components of healthy food retail interventions, briefly introduced earlier, include point-of-purchase information; nutritious food promotion through increased availability (e.g., increasing the number of healthy food options, increasing number of varieties of fruits and vegetables, increasing shelf space of whole-grain breads); pricing strategies to reduce the cost of nutritious foods relative to less nutritious foods; health promotion and communication (e.g., menu-labelling, in-store signage, shelf-labels and posters); community engagement activities (for example, stakeholder workshops and community meetings); and store owner/operator training to provide training on perishable food handling and business training, and infrastructure modifications, such as refrigeration systems or new shelving units.¹⁶⁷

To date, three reviews have assessed the overall effect of food retail outlet interventions, including supermarkets,²⁰² small food stores such as corner stores,¹⁶⁷ and outlets offering ready-to-eat prepared food.²⁰³ One review examined the impact of farmers' markets on nutrition.¹⁹⁴ Four reviewed the effects of point-of-purchase interventions specifically in food retail outlets.^{172,202,204,205} Three reviews were narrative or integrative in nature and examined grocery store marketing²⁰⁶; policy and environmental approaches to healthy food environments⁵¹; and strategies for increasing fruit and vegetable intake in grocery stores and communities.²⁰⁷

Overall Effect of Healthy Food Retail Interventions in Specific Settings

The first review found limited evidence on the effect of supermarket interventions on customer purchasing behaviour. Eight of 13 reviewed studies collecting store sales data found an increase in targeted product purchases. In the supermarket context, point-of-purchase interventions seemed to be more effective in improving nutrition and dietary practices when paired with other strategies, such as promotion and advertising, increased availability of healthy food, and pricing.²⁰² This review, overall, found sufficient evidence that interventions combining demand- and supply-side strategies significantly influenced customers as well as store owner/operators towards more healthy food purchases. The same review noted that mass media campaigns accompanying point-of-purchase interventions have been effective population-level strategies to change consumers' low-fat beverage purchasing.

Small food store interventions appear to be the food retail setting in which the largest successes have been seen. To date, 10 studies examined the impact of small food store interventions on consumer purchasing and consumption.¹⁶⁷ Of these, nine observed significantly increased purchasing frequency of at least one promoted food. No significant body mass index changes were found in any of the four trials that examined this, perhaps because the trials were too short to document a change in body weight.

Thirteen studies to date have examined the impact of interventions in outlets offering ready-to-eat prepared food.²⁰³ Studies employed diverse outcome metrics, including awareness of interventions, frequency of purchasing healthy, promoted foods, and store sales data. In general, results were promising, showing that cost-effective methods (e.g., labelling foods as healthy) may have a significant impact on prepared-food sales and consumer behavior.²⁰³

Finally, one review examined the nutritional impact of farmers' market use. All twelve reviewed studies either examined the impact of coupons for farmers' markets among women enrolled in the Supplemental Nutrition Program for Women, Infants and Children (WIC) in the US (seven studies) or farmers' markets for low-income seniors (five studies). Of the studies examining farmers' market use among WIC recipients, five of six studies showed increases in fruit and/or vegetable consumption, and one showed no increase in fruit and vegetable consumption unless participants used their own money at the farmers' market. Among seniors, in three of three studies, self-

reported eating behaviours improved after using coupons at a farmers' market. In the other two studies conducted among seniors, positive perceptions about the quality of available foods and the shopping experience were documented.¹⁹⁴ Because no studies assessed the effects of a farmers' market on nutrition-related outcomes without the use of coupons, it is unknown whether increasing access to fruits and vegetables via the presence of a farmers' market in a community is sufficient to affect diet.¹⁹⁴

Few risks or unanticipated consequences of food retail interventions were identified in the literature to date. The most substantial documented risk was profit loss risks for the food store owner,¹⁶⁷ which can be substantially lessened through formative evaluation of the intervention as well as strong partnerships between interested stakeholders.

In terms of equity, all small food interventions to date have focused on low-income populations, and most additionally targeted racial and ethnic minority communities.¹⁶⁷ This is in contrast to studies examining prepared food, where the majority of studies have been conducted in predominantly white areas and only three of 13 studies reviewed reported targeting low-income areas.²⁰³ In communities with limited access to healthy foods, combining culturally sensitive demand- and supply-side strategies is effective in promoting positive food-related behaviours.²⁰²

The main limitations in the research to date are related to study design. The limited use of randomization in existing food store intervention studies reflects the inherent difficulties of applying experimental designs to community-based health promotion and the greater suitability of quasi-experimental designs.²⁰² Few small store intervention studies have considered sales data or consumer impact outcomes, such as diet or health. In prepared-food-source interventions, studies tend to lack comparison groups, selection criteria are not readily apparent, and there is a lack of adequate measures of consumer impact.

Food store interventions seem to be feasible,²⁰² although one of the major omissions (in prepared food source interventions in particular) is the lack of formative research, which would increase feasibility.²⁰³ To engage food store owners and managers, practical strategies that will change consumer behaviour should be accompanied by a

return on investment for increasing access to more healthy foods.^{202,208} Combining strategies to reduce unhealthy food stocking and consumption and training to reduce profit loss risks should be included in future programs to increase sustainability. Policy options to modify retail food environments include mandates or licensing requirements for healthy food stocking. Indeed, efforts can be made to translate current small-store intervention findings into policy. Such policies should consider zoning or licensing mandates, economic incentives (coupons, produce coolers, tax breaks); improved store facade or layout; and incentivized partnerships between producers, manufacturers, and distributors.¹⁶⁷

In terms of the role for public health practitioners, long-term, multi-sectoral, and multiagency networks could address economic development in low-income areas with low food availability and high rates of chronic disease.¹⁶⁷ Public health practitioners should present up to date evidence when approaching grocery store owners or managers to participate in interventions. In many prepared-food-source interventions to date, public health authorities have taken a leadership role in implementation. Partnerships between public health and academic institutions may overcome many of the aforementioned gaps through improved social marketing of program strategies and benefits as well as rigorous evaluation, which would include impact assessments using psychosocial surveys and sales data collection.²⁰³

Point of Purchase Interventions in Retail Environments

Point-of-purchase information can include shelf-tags or food product labels in stores. One of the challenges in interpreting this literature accurately is that food environment interventions in food retail outlets have been assessed alongside foodservices outlets such as restaurants, which are arguably very different intervention points in the consumer food experience. In this section, we have not examined the specific literature on restaurant menu labelling, which is beyond the scope of this paper, but has been well described elsewhere.³⁹ However, we do present the results of four reviews that have examined the impact of point of purchase interventions in food outlets—including retail outlets and foodservices. These reviews have examined the impact on sales^{172,202,204,205} and diets.²⁰⁴

Point-of-purchase changes on their own showed insufficient evidence of having an effect on grocery sales in one review,²⁰² but was more effective when paired with other food environment strategies in grocery stores. In the most recent review, which assessed 17 interventions, studies' results were mixed.²⁰⁵ This review found that evidence for the effectiveness of point-of-purchase health information was not very convincing. Although the review was not a meta-analysis, the authors observed that of the five studies investigating interventions lasting longer than a year, all yielded an increase in healthy purchases, although two studies yielded divergent findings, showing increases in healthy purchases in some product categories but decreases in other product categories.

In contrast, interventions that lasted a year or less produced increases in healthy purchases in seven studies and no effects in four instances. Eight of 17 studies reporting about point-of-purchase interventions were part of complex interventions with multiple components; all resulted in increases in healthy purchases, although again, two studies also resulted in decreases in healthy purchases for some product categories. Of the nine studies that did not include additional intervention components, five resulted in increased healthy purchases, whereas four did not yield any change in purchases. The authors therefore concluded that three intervention features that appeared to increase program effectiveness are: 1) increased length of time (at least one year); 2) additional project components besides product health information; and 3) multi-component interventions that targeted both healthy and unhealthy nutrient information were more effective than those that just targeted healthy nutrient information.²⁰⁵

In 2004, Seymour and colleagues reviewed 10 grocery store intervention studies and nine restaurant intervention studies that examined the impact of point-of-purchase interventions on changes sales data, diet, or physiologic outcomes (e.g., blood pressure).²⁰⁴ Ten grocery store intervention studies, all of which were conducted in major chain grocery stores, were reviewed. All grocery store intervention studies used information strategies to promote targeted items and reported sales data. Two additionally reported dietary assessment data. Five of the 10 studies reported no increased sales of targeted items, and five studies reported increased sales for half of the targeted items at most. The three intervention studies that showed the greatest

changes in behaviour were the three that lasted for two years. Among the restaurant studies, all of which employed information strategies (which were admittedly diverse), most reported increased sales, but there was no consistent pattern of menu items targeted for promotion. Specifically, while some interventions promoted low-calorie, low-fat, or low-cholesterol foods, others promoted salads or "heart healthy foods." Simply providing information in the restaurant setting appeared to be associated with increased purchase of targeted items, suggesting that the specific intervention strategies were not as important as the act of intervening. Like Seymour and colleagues, Mayer (1989) likewise compared point-of-purchase interventions in different settings and found them to be more effective in restaurants (all eight studies reviewed showed some positive effects) than supermarkets (two studies found some positive effects while four found no effects).¹⁷²

None of the literature reviews identified equity implications of point-of-purchase interventions.

In terms of the role of public health practitioners, working with nontraditional partners, such as chefs (who understand the importance of taste and quality), growers and shippers (to increase the availability of high-quality produce), and food companies is essential for feasibility and effectiveness. The population shift toward consumption of prepared foods emphasizes the need to work with these types of outlets to improve the healthfulness of the foods being served.²⁰⁴ Finally, several gaps were identified in the literature reviews. First, the type of intervention, the foods targeted, and the analysis methods differed from study to study. Few studies described the population affected by the intervention, and those that did provided few specifics. Little information was provided about intervention costs or sustainability.

Conclusion

The "productionist paradigm" that has guided the evolution of our dominant food system model for much of the past century has contributed to changing patterns of disease and access to an abundance of cheap, energy-dense, and nutrient-poor foods. This paper has argued that there is a substantial connection between health outcomes and food environments, as well as the need for public health actors to continue to focus on opportunities to support health-promoting environments.

As is often the case, many knowledge gaps exist in terms of identifying effective “big P” or “small p” actions. The existing array of evidence has shown some positive health outcomes related to pricing strategies and reducing unhealthy food availability in small food stores but is generally not clear-cut for other interventions. This can be related to intervention complexity, but is more often due to a lack of research or evaluation overall, and a lack of methodological consistency across the literature.

Although city-region governments have historically been marginalized in the arena of food system governance, we have also made the case that there is a wealth of opportunities for local actors including public health to assert their influence toward healthier, more sustainable food systems. More and more cities are exploring previously untapped food connections with policy levers such as land use planning, economic development, data transparency, and procurement practices. While it may seem counterintuitive that actors with a narrower breadth of formal authorities, such as local governments, should become a significant driver of food system renewal, their proximity to citizens and ability to be more nimble gives them great potential.

The “healthy cities” movement and ecological approaches to health underpin the literature on food environments. These approaches suggest that health, broadly defined and more than the absence of disease, can be an organizing principle for planning physical spaces, markets, and economies. Health is not necessarily high on everyone’s agenda, however, and not all policy actors have access to, interest in, or the capacity to apply health evidence in their everyday work. Public health actors have a role to play in making the linkages between health and other policy goals explicit, since public policy is a tool that

can be used to shift structures and environmental contexts in ways that are more health promoting. This can happen in a few different ways. Individuals make decisions based on cognitive and social inputs. Environmental interventions can make decision-making inputs more accessible to cognitive processing, or, given that individuals are largely regarded as being boundedly rational, can alter social norms in ways that alter the material and ideational incentives to decision making. In other words, food environment interventions operating on health promotion principles should increase the availability and accessibility of information for decision-making at the same time that they can make healthier choices easier, more appealing, and less costly.

Reshaping food environments toward health does not simply mean opening new supermarkets in “food deserts.” It requires experimentation with a range of interventions throughout the food system (from production, distribution to retail, consumption and waste management). Because the food system overlaps so many other modes of social organization (markets, firms, associations, communities, families), actors from different sectors and networks are usually implicated in any food environment intervention. In addition, since no authority has overarching control over food, interventions to promote health, social, economic, and environmental goals necessarily require effective collaborations across multiple bureaucratic silos and with the private sector, institutions, and citizens. Local public health actors, in particular, could play a key role given their unique mix of expertise and experience in coordination, facilitation, community engagement, research and evaluation. Through such innovations, public health, including environmental health professionals, can have an important role to play in driving food system renewal in healthier and more sustainable ways.

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Appendix A. A note on food security, food insecurity, community food security, and food access

In this report, we define *food insecurity* specifically as the inability to access food due to individual and household level financial constraints, which is a social determinant of health.²⁰⁹ Relevant policy interventions to address food insecurity include social policy interventions in a broader welfare state context. Importantly, food insecurity policy should not be viewed as the “flip side” of food security policy.²¹⁰ *Food security* was defined by the FAO (1996) Rome Declaration as when “all people, at all times, have physical, social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.”²¹¹

The *community food security* model is rooted in a community development approach to food system intervention, focusing on community capacity building and skill development as the preferred methods to improve food security in the community context. In the last two decades, as variety of civil society and public health actors have adopted the rubric of community food security to advocate for adequate and sustainable livelihoods, local and diverse food production, healthier ecosystems, wider access to healthy food, food-based local economic development, and interventions to improve social cohesion.³⁶ Community-based responses to food insecurity have also been formulated as an alternative to the charitable model (i.e., private sector food assistance responses).³⁶ Public health actors have been key players in food security and food insecurity policy in Canada, but have essentially struggled with how to incorporate macro-social food insecurity interventions (i.e., addressing income security) within core public health and health promotion mandates,⁴⁶ whereas community food security interventions appear to be more closely aligned with traditional public health practice. The Ryerson Centre for Studies in Food Security has defined community food security in terms of five A's: Availability (sufficient quantity); Accessibility (including physical and economic access); Adequacy (safe, nutritious, and sustainable food); Acceptability (a right to food that is socio-culturally acceptable); and Agency (the enabling policies and process that permit individuals to achieve food security).

Each of these are important concepts that address different elements of a complex set of interrelated, but also distinct societal problems, and different framing of desired process and outcome goals. We have elected not to highlight the terminology of food security in this discussion paper, focusing instead on the language of food systems, city-regions, policy interventions, and food environments.

Appendix B. A brief overview of the literature on pricing strategies

Taxation as a policy instrument

From an economic standpoint, the overarching purpose of pricing strategies is to shift consumer behaviour through shifting demand, which also relies on the concept that people are more than boundedly rational. From one standpoint, pricing strategies, which includes the domain of tax policies, can compensate for externalities by internalizing costs into the marketplace—a so-called “junk food tax” does so by having people pay a higher price for the goods they want, and higher than the market price without regulation, which will lead them to respond by consuming less of that good. In this scenario, people (as consumers) lose welfare proximally, but producers also lose welfare, as they will sell less of the good. The state and people (as tax-based revenue beneficiaries) gain welfare because there will be more tax revenue to spend on other items with a benefit to society, a concept discussed as deadweight loss. Another version of deadweight loss, however, is to subsidize foods that are particularly “healthy.” In this scenario, people as consumers gain because they pay a lower price and get more of the good, producers also gain because people buy more, but “taxpayers” lose because it costs revenue to implement.

The evidence on the effects of pricing strategies on consumer food behaviour

The majority of published literature examining food prices has examined price elasticity of various foods,²¹²⁻²¹⁴ experimental economics,²¹⁵ and the impact of food prices on diet-related outcomes.^{165,190,213,216-218} Only one review has examined the impact of agriculture-led food price policies.²¹⁹

Price elasticity is defined as the percentage change in quantity demanded (consumption or purchases) of a good resulting from a 1% change in the price of the good. Demand for a good is considered “price inelastic” if its price elasticity is smaller than the absolute value of one and “price elastic” when its price elasticity is greater than one in absolute value.²¹³ Importantly, foods that have greater elasticity are those for which purchasing would be more responsive to taxes (decreased purchasing) or subsidies (increased purchasing).

Food price elasticity literature has been assessed by three reviews.²¹²⁻²¹⁴ In general, demand for food is more responsive (elastic) to price changes among household with lower incomes.²¹⁴ In one review assessing 136 studies representing 3495 estimates of food price elasticities of various food categories from 162 countries, the elasticities of dietary staples (e.g., cereals, fat, oils) were lower than those of animal food sources (meat, fish, and dairy), suggesting that animal food sources represent “luxury foods.”

Consistent with this, a review of 160 studies by Andreyeva et al. (2010) found that less healthy foods seemed to be more price elastic than more healthy foods (the range of all foods and non-alcoholic beverages assessed was 0.27 to 0.81).²¹² Less healthy foods, such as those purchased away from home, soft drinks, juice, and meats had elasticity estimates between 0.68 and 0.81. The authors suggest that taxes on these foods would therefore significantly reduce their purchases. For example, soft drinks had a price elasticity of 0.8, suggesting that a 10% increase in soft drink prices would reduce their consumption by 8-10%.

The final review examining price elasticities found a relatively small body of evidence examining fast-food price elasticity. The authors found that fast food had an average price elasticity of -0.52, suggesting that raising the price of fast food by 20% would reduce demand by about 10%. Fruits and vegetables were found to be similarly price inelastic, (fruits were -0.49 and vegetables were -0.42) with a subsidy of 20% expected to increase demand by 10%.

One review assessed experimental economic research to determine the extent to which price changes influence food purchases, total calories or macronutrients purchased, interactions between price changes and complementary interventions, and moderators of sensitivity to price changes.²¹⁵ The authors found that, although complementary research on food pricing is in its infancy, its potential to improve purchasing and eating behaviors at the population level means experimental economic research is indeed a valuable approach to improving population nutrition. Of relevance for this report, four supermarket or farmers’ market studies were reviewed by Epstein et al (2012), all of which provided discounts on fruits and vegetables or healthy foods more broadly.²¹⁵ Of the four studies, two found significant, positive impacts on dietary outcomes. Three of the studies provided educational interventions in addition to pricing interventions. In all cases, price changes were more effective than was education on food purchases. One of the most notable findings of the review is that taxes resulted in a reduction in energy purchased, whereas subsidies increased energy purchased (even for healthy foods, such as fruit and vegetables),

which would favor taxes as a strategy to reduce obesity. In addition, this review found that in nearly all studies that included complementary approaches to modifying purchases (in addition to pricing interventions), pricing effects were larger than the effects of nutrition information alone.

Five reviews assessed studies on the impact of food prices on diet or health outcomes. Foods and diets of higher nutritional quality have been consistently associated with higher diet and energy costs.^{165,218} Moreover, these lower-cost, energy dense diets tend to be high in added sugar and fat and represent the highest-palatability consumer option.¹⁶⁵ Over time, the cost of healthy food has increased faster than the cost of less healthy foods, and healthier alternatives tend to be more costly than their regular counterparts.²¹⁸ Nutritious diets were deemed in several studies to be unaffordable for low-income populations and barely affordable for average-income earners.²¹⁸

Food price has been significantly related to food consumption, diet quality, and nutrition-related disease risk.²¹⁸ One review found that of the statistically significant associations found between food and restaurant prices and weight outcomes, the effects were generally small in magnitude.²¹⁷ Although fast-food prices are generally not significantly related to weight outcomes among adults or young children, four of five studies found higher fast-food prices to be significantly associated with lower weight outcomes among adolescents, particularly among low- to middle-SES adolescents and those with higher BMIs.²¹⁷ Powell and Bao (2009) determined that subsidizing fruit and vegetables showed mixed results in terms of reducing adults' weight.²¹⁷ However, significant effects were found for female adults, with larger effects for poorer women and women with children. Evidence was fairly consistent that lower prices for fruits and vegetables were associated with lower weight outcomes among low-income populations.

One review examined food pricing strategy simulations and changes in food purchases or intake, health and disease outcomes, and whether SES moderates these associations.²¹⁶ Their model predicted a 0.2% fall in energy intake from saturated fat for each 10% price increase. The authors found that a 10% increase in the price of soft drinks could decrease consumption by between 1% and 24%, and a 10% decrease in the price of fruits and vegetables could increase consumption by between 2% to 8%.

Finally, one review examined the impact of agriculture-led pricing policies on diet or health outcomes. Only two studies were conducted in the developed world: one study from the Netherlands found that removing the fruit and vegetable withdrawal policy (a component of the Common Agricultural Policy in which fruit and vegetable produce is withdrawn from the market place in order to keep producer prices high) would slightly increase fruit and vegetable consumption (by up to 6g/person/day), reduce the incidence of cardiovascular disease and cancer, reduce the DALYs (disability-adjusted life-years) lost per year and modestly increase life expectancy (by 2-4 days). The other study, done in the US, showed that removing the existing farm subsidies on grain commodities would result in a modest reduction in weight (0.11kg/person/year).²¹⁹ Clearly, more research is needed to determine the overall impact of agriculture-led pricing policies on public health outcomes of interest.

Several unanticipated consequences were identified through the literature review. First, compensatory buying practices through cross-price elasticities were identified in two high-quality studies.²¹⁶ Compensatory buying practices can occur, for example, if people use the "savings" from subsidized fruits and vegetables to purchase less-healthy "luxury items," which would have deleterious effects on health overall.^{215,216} For example, one study estimated a potential increase in consumption of sodium in response to a saturated fat tax, while another found potential increases in mortality from cardiovascular disease in response to a tax on less nutritious foods.²¹⁶

In terms of equity, 11 of 14 studies evaluating lower socio-economic groups estimated that food pricing strategies would be associated with pro-health outcomes.²¹⁶ Food pricing strategies therefore have the potential to reduce disparities, since they have a stronger effect on low-income populations.^{213,216,217} Powell and colleagues (2013) also found consistent evidence that lower fruit and vegetable prices were associated with lower weight outcomes among low-income populations.²¹³

Several gaps in the research remain. First, several authors have suggested that the modest "junk food" taxes or fruit and vegetable subsidies that would be politically acceptable would not result in health benefits.^{213,216,217} However, benefits to price changes may occur regardless of health outcomes. For example, generating increased tax revenue could benefit public health through providing funding for health promotion programs, subsidizing healthier foods.²¹⁵ Second, given that the provision of nutritional information is less effective than price changes in changing food purchasing behaviours, future research should examine how to best craft point-of-purchase information to boost pricing effects to maximize the effects of manipulating prices.²¹⁵ For example, while shoppers may be notified of "sale" products, taxes or general price increases are usually not displayed in the shopping environment. Therefore, shoppers may not be provided with information on which products are now more expensive. Since sales taxes are collected at the register, many consumers may not know how much more they are

paying for particular products, which may minimize the effect of price increases on purchasing. If the shopper has no knowledge that a tax is being implemented, the tax cannot influence behavior. Thus, research is needed to understand the best way to inform people of taxes to maximize their effect on purchasing.²¹⁵

Finally, in terms of feasibility, in the absence of government (or other) subsidies for fruits and vegetables, large increases in sales volume may be required to offset profit decreases resulting from price reductions.⁵¹ Therefore, some have advocated a “mix” of interventions, where the price of less-nutritious foods are raised to generate revenues that can be used to subsidize more nutritious foods.⁵¹ It is important to note that challenges to the implementation of food taxes are expected to come from the general public, industry, and special-interest groups. Indeed, it is likely that opposition to taxing less-nutritious foods will be mounted by food and beverage industries, convenience store associations, and restaurants.²²⁰

Table 1. Food taxation as a pricing strategy (Source: adapted from Kim and Kawachi 2006,^{221(p436)} used with permission.)

Food taxation policies		Comment
Rationale	Economic (asymmetric information, costs of obesity to society)	Consumers' nutritional awareness and information may be distorted given massive advertising budgets of the food industry, which dwarf government advertising to promote healthy diets. Obesity costs to society are an additional economic rationale for supporting the taxation of “junk foods.”
	Potential to reduce consumption or general funds for obesity prevention	Food taxation could be justified based on population coverage and evidence from price elasticity studies and provincial or federal analyses of revenue generation.
Potential barriers and limitations	Opposition by food industry	Industry-backed special interest groups have a history of strong lobbying against soft drink and snack food taxes and are a major barrier to implementation.
	Public opinion	In the US, recent national public opinion surveys have found support to be relatively low for taxation of foods for obesity prevention.
	Lack of economic evaluation	
	Gaps between research and policy	It takes time for research to be accepted into policy and practice.
Potential unintended consequences	High price elasticity in youth and/or low-income groups	The extent to which increasing “junk food” prices would result in unhealthy behavioral substitutes is unknown.
	Regressiveness towards low-income groups	Low-income groups spend a larger proportion of their income on snack foods. Therefore some (including the Grocery Manufacturers of America) have argued that snack food taxes are discriminatory because they disproportionately affect lower-income groups.

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