State of the Evidence Review on Urban Health and Healthy Weights
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About the Canadian Population Health Initiative

The Canadian Population Health Initiative (CPHI), a part of the Canadian Institute for Health Information (CIHI), was created in 1999. CPHI’s mission is twofold:

- To foster a better understanding of factors that affect the health of individuals and communities; and
- To contribute to the development of policies that reduce inequities and improve the health and well-being of Canadians.

As a key actor in population health, CPHI:

- Provides analysis of Canadian and international population health evidence to inform policies that improve the health of Canadians;
- Commissions research and builds research partnerships to enhance understanding of research findings and to promote analysis of strategies that improve population health;
- Synthesizes evidence about policy experiences, analyzes evidence on the effectiveness of policy initiatives and develops policy options;
- Works to improve public knowledge and understanding of the determinants that affect individual and community health and well-being; and
- Works within CIHI to contribute to improvements in Canada’s health system and the health of Canadians.

For more information on CPHI and its publications, please visit: www.cihi.ca/cphi.
About the Canadian Institute for Health Information

CIHI collects and analyzes information on health and health care in Canada and makes it publicly available. Canada’s federal, provincial and territorial governments created CIHI as a not-for-profit, independent organization dedicated to forging a common approach to Canadian health information. CIHI’s goal: to provide timely, accurate and comparable information. CIHI’s data and reports inform health policies, support the effective delivery of health services and raise awareness among Canadians of the factors that contribute to good health.

For more information on CIHI and its publications, please visit: www.cihi.ca.
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It should be noted that the conclusions in the report do not necessarily reflect those of CPHI or CIHI.

This report was peer-reviewed.
Main Messages From State of the Evidence Review on Urban Health and Healthy Weights

This review revealed that evidence exists for associations between aspects of the urban environment and behaviours contributing to obesity.

**Economic environments**—For individuals, a lower socio-economic status (education level, income, employment) was often associated with increased obesity among both adults and children. For instance, lower personal income affects affordability of food, which demonstrates the most consistent influence on food consumption. Similarly, individuals living in middle-income to high-income neighbourhoods are more likely to be physically active than their counterparts in lower-income neighbourhoods. Lower-income neighbourhoods are also more likely to contain greater access to sources of energy-dense foods (for example, fast foods) and lower access to supermarkets or other stores stocking healthy foods.

**What this means** is that interventions aimed at improving the income and educational status of individuals and families within urban environments may help address disparities in obesity. Also, improving access to healthy foods and recreation opportunities in lower-income neighbourhoods may help to create a “healthy weight” friendly environment.

**School environment**—Although schools are not specific to urban areas, studies from interventions performed in schools (for example, availability of healthy choices in vending machines or point-of-purchase nutrition information) showed evidence for improving eating behaviours. All studies had at least some positive effects on food intake, either increasing healthy food choices or decreasing unhealthy alternatives, though no school interventions significantly affected body weights. However, it should be noted that some studies that have assessed the impact of school-based programs on body weights may not have been included in this review because they did not specify an urban setting.

**What this means** is that comprehensive school food policies or educational interventions that promote healthy food choices are likely to have beneficial effects on children’s eating habits.

**Built environment**—The most consistent environmental associations observed for physical activity were elements of the built environment. Hallmarks of walkability (for example, increased residential density, mixed-use zoning and street connectivity) and access to recreational facilities are associated with healthy body weights. People’s perceptions of their built environment are also key.

**What this means** is that walkability of neighbourhoods and access to recreational facilities in and around neighbourhoods may assist in promoting healthy weights.

**Lack of intervention evidence**—Very little evidence exists for the effectiveness of interventions in achieving healthy weights in an urban context. More evaluations are needed to take into account natural experiments in urban environments (for example, does the proliferation of bicycle lanes increase cycling?).
Executive Summary From State of the Evidence Review on Urban Health and Healthy Weights

Rationale and Purpose

The relationship between urban environments and obesity has received little systematic attention. Our purpose was to review and synthesize the evidence on:

a) structural and community-level characteristics of urban environments that promote or inhibit the achievement of healthy weights; and

b) the effectiveness of interventions to assist urban populations in achieving healthy weights.

What We Found in the Literature

We found probable evidence for associations between economic settings and obesity. For example, a lower individual socio-economic status (SES) was often associated with increased obesity among adults and children (page 15). Lower personal incomes affect affordability of food, and affordability has the most consistent influence on food consumption. In addition, lower-SES individuals report more barriers to and less participation in physical activity.

As was the case with individual household SES, neighbourhood SES was associated with body weights. For instance, individuals living in middle- to high-income neighbourhoods are more likely to be physically active than their counterparts in lower-income neighbourhoods. Lower-income neighbourhoods are also more likely to contain greater access to sources of energy-dense foods (for example, fast foods) and lower access to supermarkets or other stores stocking healthy foods.

The school environment was found to be a potential setting for interventions to promote healthy eating among children. Programs within the school environment (for example, promotion of healthy foods, price incentives) are generally associated with an increased consumption of healthier foods (page 20).

The urban built environment was associated with both physical activity and healthy body weights. Studies consistently show that factors that promote obesity (for example, urban sprawl, low intersection density, low residential density, low land-use mix) tend also to favour sedentary behaviour and lower physical activity levels (page 18). Because most of the evidence reviewed was cross-sectional, this suggests that a supportive urban physical setting may be advantageous, but perhaps insufficient by itself to have a significant impact on obesity.

Culture and ethnicity (socio-cultural environment) also factored into our findings. Adoption of a more “Western” lifestyle had predominantly negative effects on food, nutrition and dietary habits. Furthermore, the more accepting cultures were of cars, the less likely they were to be physically active.
Due to a lack of systematic studies in this area, very little evidence was found to support the role of policy in promoting healthy weights.

Similar to the lack of findings in the policy area, very little evidence was available for the effectiveness of interventions in achieving healthy weights in an urban environment.

**What We Found Talking With Experts**

A group of attendees of an obesity symposium held in 2005 were surveyed about the elements of the urban environment that contribute to healthy body weights. Most respondents felt that the more immediate built environment (for example, bike trails, walking paths) has a greater impact on healthy weights than broader societal trends. When asked whether changes could be made to the built environment to address the issue of obesity, nearly all respondents said yes.

**What We Found in Policy Documents**

Obesity has been framed increasingly as a global threat to health and an “epidemic.” The growing threat that overweight and obesity poses for children of the world has been identified as a major policy issue. Implicit in the evidence is an increasing recognition of the complexity of the issue and the need for the coordinated involvement of a range of policy actors across sectors and settings to link independent policies and processes. With regard to the policy analysis conducted, a large number of policy responses were identified in relation to obesity and the environment, but relatively few have been systematically tested.

**Comparison With Other Reviews**

While it is difficult to compare results from different studies because of the variability in methods used, our review is consistent with other published reviews of the literature. For instance, in a review of mostly cross-sectional studies, Booth and colleagues38 surmise that the built environment, most often assessed at the level of the neighbourhood, has the potential to influence body weights. Our systematic review is in general agreement with Booth et al.; however, it is important to note that our review was limited to urban environments and a large proportion of the findings we identified did not reach statistical significance.

**Conclusion**

Overall, we found some evidence for associations between structural characteristics of urban environments and healthy weights or the behaviours associated with healthy weights. Perhaps the most striking finding in our review was the complete lack of evidence for the role of political settings and sectors in relation to obesity/healthy weights in the urban context. In addition to a gap in knowledge about the complex associations among factors contributing to obesity, there also appears to be a knowledge gap around the impact of possible policy responses.
Method for Literature Review

Extensive searches were conducted through numerous databases and documents across a variety of fields, including health, social sciences, urban planning and transportation; 65,929 titles were scanned, resulting in approximately 2,349 documents being retrieved, with 355 included in the final review. Using two conceptual frameworks, ANGELO (analysis grid for environments linked to obesity) and SDEHP (social determinants of health and environmental health promotion), all documents were coded for relationships between types of environment (physical, economic, political, socio-cultural) and levels of environment (settings, sectors) and obesogenic behaviour (diet, physical activity, sedentary) or body weight. Findings from these levels and outcome behaviours were summarized and cross-tabulated with key article quality indicators to determine the strength of the evidence gathered for each section. To assist with putting the findings into context, an analysis of policy-relevant documents was conducted, along with a survey of researchers and decision-makers who attended a think tank on obesity in October 2005.
Abstract

Rationale: To date, evidence on structures of urban environments and implications for obesity rates have not been subject to systematic review. The evidence base for effective environmental interventions is even less well delineated.

Purpose: To review and synthesize evidence on a) structural and community-level characteristics of urban environments that promote or inhibit the achievement of healthy weights and b) the effectiveness of interventions to assist urban populations in achieving healthy weights.

Method: Extensive searches were conducted through numerous databases and documents; 65,929 titles were scanned, resulting in approximately 2,349 documents being retrieved, with 355 included in the final review. Using two conceptual frameworks, all documents were coded for relationships between types of environment (physical, economic, political, socio-cultural) and levels of environment (settings, sectors) and obesogenic behaviour (diet, physical activity, sedentary behaviour) or body weight. To assist with putting the findings into context, an analysis of policy-relevant documents was conducted, along with a survey of researchers and decision-makers who attended a think tank on obesity in October of 2005.

Results: The analysis resulted in 1,325 findings, with the majority coming from research related to physical activity (n = 712) and diet (n = 349). The strongest levels of evidence for associations between environments and obesogenic behaviour or body weight were observed for physical (diet), socio-cultural (diet, sedentary behaviour, obesity/healthy weights) and economic (diet, physical activity, obesity/healthy weights) settings and physical (physical activity), economic (diet, physical activity, sedentary behaviour) and socio-cultural (diet, physical activity, obesity/healthy weights) sectors. Very little evidence existed for the effectiveness of interventions in achieving healthy weights (see tables 2 and 3 on page 27).

Of the researchers and decision-makers we surveyed, most responded that urban design issues and accessibility of physical activity and nutrition opportunities (mainly in the physical setting and physical sector) were the most important factors influencing healthy body weights in an urban environment. Respondents also felt that these factors could be addressed by policy responses, but no specific recommendations were provided. With regard to the policy analysis, a large number of policy responses were identified in relation to obesity and the environment, but relatively few have been systematically tested. Thus, in addition to a gap in knowledge about the complex relationships among factors contributing to obesity, there is also a knowledge gap about the impact of possible policy responses.

Conclusions: Some evidence exists for associations between aspects of the urban environment and obesogenic behaviour and/or obesity/healthy weights, implicating interventions in policy and practice. However, lack of evidence on effective interventions and policy initiatives suggests a need for research to fill knowledge gaps.
Project Background

1.1 Introduction

The rapid rise in obesity in Canada over the past two decades\(^1\) has led to a sense of urgency among practitioners and policy-makers around the need for more effective approaches to obesity prevention. Increasingly, and perhaps intuitively, public health researchers and decision-makers have attributed the emerging obesity epidemic to rapid changes in social and physical environments\(^2\) and have called for a broader multi-level approach to prevention. Such an approach addresses policy and environmental facilitators of obesogenic (obesity-promoting) behaviours (for example, poor diet and sedentary behaviour). Several prominent researchers make compelling arguments that the environment determines the prevalence of obesity in a population and that broad environmental interventions should be more effective than individual-based interventions in reducing the population burden of obesity.\(^3\)\(^-\)\(^7\) Yet little research is available on environmental influences on obesity\(^4\) and that which is known is inferred from epidemiological and cultural observations. To date, evidence on the changing structures of urban environments and implications for obesity rates has not been subject to a systematic review. The evidence base for the process and outcomes of implementing effective environmental interventions is even less well delineated. It is these gaps in knowledge that will be addressed by this State of the Evidence Review.

1.2 Statement of Purpose

Purpose: The purpose of the State of the Evidence Review is to review and synthesize evidence from research and grey literature on:

- structural and community-level characteristics of urban environments that promote or inhibit the achievement of healthy weights; and
- the effectiveness of interventions to assist populations in achieving healthy weights.

The purpose follows directly from the Canadian Population Health Initiative’s (CPHI) stated research question:

- To what extent do structural or community-level characteristics of urban environments encourage or inhibit the achievement of healthy weights?

1.3 Conceptual Framework

The State of the Evidence Review was guided by integrating two conceptual frameworks. The first, suggested by CPHI, is the Schulz and Northridge model of social determinants of health and environmental health promotion (SDEHP).\(^8\) The SDEHP model describes fundamental (macro), intermediate (meso/community) and proximate (micro/interpersonal) levels of influence on the health of populations. The second, developed specifically for obesity, is known as ANGELO (analysis grid for environments linked to obesity) by Swinburn et al.\(^7\) and is helpful for understanding relationships between environments and obesity-relevant behaviours (such as food intake and physical activity).
Based upon the Epidemiological Triad, the basic premise of the ANGELO framework is that the environment influences body weight through energy intake and energy expenditure, which Swinburn and colleagues call “vectors” or mediators. The ANGELO framework is a 2 x 4 grid describing environments by size (micro/settings or macro/sectors) and type (physical, economic, political, socio-cultural). Within the grid, elements affecting food intake (FI) and physical activity (PA) are characterized as obesogenic or leptogenic (promoting leanness). While the SDEHP model has not been validated with respect to obesity, it does provide a useful framework for organizing potential environmental determinants of health status, including obesity. The SDEHP model is also not limited to dietary and PA behaviours. It was essential that the review extend beyond an analysis of environmental determinants of behaviours, as the environment may be contributing to obesity through alternate, yet-to-be-delineated mechanisms. The ANGELO framework is complementary, in that the levels of influence (macro and micro) are comparable to the SDEHP’s intermediate and proximate levels that CPHI has identified as most relevant to the review because of their modifiability. The ANGELO framework adds validity, in that it has been piloted at the population level for use in prioritizing interventions by rating for validity (evidence of impact), relevance (to local context) and potential changeability.

<table>
<thead>
<tr>
<th>Environmental Size/Type</th>
<th>Physical</th>
<th>Economic</th>
<th>Political</th>
<th>Socio-Cultural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settings (community-level)</td>
<td>Accessibility to food service outlets (for example, restaurants)</td>
<td>Affordability of food service outlets</td>
<td>School food or physical activity policies</td>
<td>Acceptability of active transportation (cycling, walking)</td>
</tr>
<tr>
<td></td>
<td>Accessibility to food retail opportunities (for example, supermarkets)</td>
<td>Affordability of food retail opportunities</td>
<td>Work-site food or physical activity policies</td>
<td>Family role models for food and activity patterns</td>
</tr>
<tr>
<td></td>
<td>Accessibility to recreational facilities</td>
<td>Affordability of recreational facilities</td>
<td>Availability of health-related services</td>
<td>Ethnic and cultural demographics of neighbourhoods</td>
</tr>
<tr>
<td></td>
<td>Number and quality of walking paths and cycleways</td>
<td>Direct marketing of food products in schools (for example, vending machines)</td>
<td>Civic participation</td>
<td>Crime and safety</td>
</tr>
<tr>
<td></td>
<td>Availability of transit and transit stops</td>
<td>Neighbourhood socio-economic status (income, education, employment)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sectors (structural)</td>
<td>Urban design</td>
<td>Market forces (for example, food production, distribution, price)</td>
<td>Socio-economic equity</td>
<td>Globalization</td>
</tr>
<tr>
<td></td>
<td>Technology and automation</td>
<td></td>
<td>Taxation and subsidies (food price structure)</td>
<td>Cultural acceptability of overweight</td>
</tr>
<tr>
<td></td>
<td>Transportation systems</td>
<td></td>
<td>Funding for education, health and social service systems</td>
<td>Media/advertising</td>
</tr>
</tbody>
</table>
Since each framework uses slightly different terms to identify levels of environmental influence, we have chosen to use clear language with terms that are descriptive to a wide variety of stakeholders. Thus, ANGEL0’s “micro” and SDEHP’s “proximate” levels are now termed “settings” and refer to individual- and community-level environments. Settings “are usually geographically distinct, are relatively small, and are potentially influenced by individuals.” Similarly, ANGEL0’s “macro” and SDEHP’s “intermediate” levels are now termed “sectors” and refer to more structural environments (Table 1). In general, sectors “are common to the wider population, often operating at regional, national, and international levels, and tend to be geographically diffuse.”
2 Methodology

This State of the Evidence Review encompassed three components. First, a systematic review of published and grey literature was conducted. Second, policy-relevant documents were reviewed to get a sense of the policy context in which urban environmental influences of obesity operate. Third, relevant decision-makers were consulted to gather their input on the review and how its findings may relate to current policies and practice.

2.1 Systematic Literature Review

The systematic literature review took place in several stages, progressing from initial literature searches to article assessments. The large volume of literature retrieved during the searches necessitated a multi-stage screening process, graphically represented by the project flow chart in Appendix A.

2.1.1 Literature Search Strategy

The first stage of the systematic review was to identify appropriate literature databases to search. Utilizing the expertise of Linda Slater, a librarian skilled in literature search techniques and strategies, appropriate bodies of literature were identified. A search of many databases was conducted to identify studies addressing the research questions. Databases were searched from the date of their inception (for example, MEDLINE from 1966 and EMBASE from 1998) until August 31, 2005. Specifically, all research that measured associations and/or tested interventions between intermediate and proximate factors of urban environments and behaviours (food intake, physical activity, sedentary behaviour) and/or body weight were sought.

Keywords included *body weight, obesity, physical activity, diet, food, urban and policy*, along with terms related to the urban environment (for example, transportation, socio-economic status). Refer to Appendix B for an example of a detailed search of the MEDLINE/HealthStar literature database. The following databases were searched:

- Cochrane Database of Systematic Reviews
- Cochrane Controlled Trials Register
- ACP Journal Club
- Campbell Collaboration
- MEDLINE
- EMBASE
- CINAHL
- HealthPromis (NHS Public Health/Health Promotion database)
- HealthStar
- CAB Abstracts
- AGRICOLA
- Biological and Agricultural Index
• Food Science & Technology Abstracts
• Sociological Abstracts
• SportDiscus
• Web of Science
• PsycINFO
• ERIC
• Enviroline

Grey Literature Databases:
• OCLC ProceedingsFirst
• OCLC PapersFirst
• Dissertation Abstracts International
• Conference Paper Index
• U.S. GPO (U.S. government publications)
• Canadian Research Index (Canadian government publications)
• OCLC WorldCat (union catalogue of major research libraries)
• Google Scholar
• TRIS (Transportation Research Information Services)

In addition to database subject searches, the following tasks were undertaken to identify additional relevant studies not retrieved in the database searches:

• citation searches on Web of Science for identified experts in the area, to determine what they have published and related papers where they have been cited; and
• examination of reference lists and bibliographies of identified studies and reviews for potentially relevant studies.

Records returned from the literature database searches were downloaded into a reference manager program (ProCite) and catalogued by literature database (for example, MEDLINE, EMBASE).

2.1.2 Literature Title Scan

The second stage of the systematic review involved a title scan to reduce the volume of articles retrieved from the literature searches. Article titles were assessed against the review’s purpose statement, as well as the more specific review criteria contained in Appendix C. Because limited information could be gleaned from the article titles, only those that were obviously unrelated to the review purpose were eliminated. All others with key words relevant to the purpose of the systematic review (for example, urban environment, obesity) were retained and reviewed in further detail.
2.1.3 Literature Abstract Scan

The third stage of the systematic review involved examining the abstracts of each article to determine if the article fit into the stated review criteria. Articles passing through this stage were required to fulfill three criteria, listed as Step 1 on the article coding form (Appendix C). All articles that did not fulfill one or more criteria were immediately dropped from consideration.

The first criterion was whether the article included one or more of the four major topics falling under the review: obesity/healthy weights, food/diet/nutrition, physical activity and sedentary behaviour. The article must have had one or more of these topics as either the main rationale for the article or as a major finding within the paper.

The second criterion assessed whether the article involved any environmental sectors or settings pertinent to the review. More specifically, the study needed to be framed within or around one or more of the eight sectors or settings profiled in Table 1.

Finally, the third criterion was whether the article involved an urban environment in a developed or developing country. For the purposes of this review, an urban environment was defined as having “... a minimum population concentration of 1,000 persons and a population density of at least 400 persons per square kilometre, based on the current census population count. Any territory outside of urban areas is classified as rural.”

Because there are many different definitions of “urban” and “rural” around the world, this definition was used as a guide rather than an absolute standard. Literature had to report on data collected in an urban environment or provide breakdowns of data so that urban-specific findings were apparent. Information on the broader study setting was rarely given, unless it was a major part of the article itself; therefore, in the majority of cases, reviewers deferred judgment of this criterion to what was stated by the authors of the article.

The relatively open-ended search strategy undertaken in this review resulted in articles of many different formats being retrieved. Many of the articles, such as technical reports or older journal titles, did not have abstracts to be scanned. This required that the article be found in its entirety and subjected to the same assessment procedure detailed above.

2.1.4 Literature Full Review

The full review of the final literature selections involved two distinct processes. The first process entailed pulling individual findings from each article under review, with the coded findings then being compiled and analyzed. The second involved assessing the individual articles for quality, including ratings of several critical article features and coding of the study design. This allowed the authors to make a qualified assessment as to the strength of the findings in any topic area. Because studies often contained findings on more than one topic area and/or contained multiple findings within a topic, the finding rather than the study was the unit of analysis in this review.
Coding Article Findings

To provide a summary of what is known and unknown about the association between the urban environment and healthy weights, findings and other characteristics were coded and subjected to a frequency analysis. Articles were coded for characteristics of the sample population, environment size and type, direction of finding/outcome, study design and study quality (see Appendix C).

Characteristics of the sample population—Age group, ethnic characteristics and gender were coded with each finding.

Environment size and type—According to the ANGELO grid, the urban environment elements in the literature were coded for the size (settings, sectors), type (physical, economic, political, socio-cultural) and specific feature (for example, transportation).

Direction of finding/outcome—The direction of the association or effect was coded as follows:
0 = no association
1 = inverse association
2 = direct positive association
3 = u-shaped association

The number of findings reporting a particular pattern were then counted. This is similar to a procedure used by Sobal and Stunkard10 in a review of socio-economic status and obesity.

Design—The design of the study was rated according to categorizations of evidence presented by Philp:11
A1 = Systematic reviews which include at least one randomized controlled trial
A2 = Other systematic and high-quality reviews
B1 = Individual randomized controlled trials, randomized experimental studies
B2 = Non-randomized, experimental studies
B3 = Well-designed, non-experimental studies, controlled statistically if appropriate; also include well-designed qualitative studies
C1 = Descriptive and other research (for example, convenience samples) not in B
C2 = Case studies and examples of good practice

This approach was adopted because it allows studies with different designs, including systematic reviews and qualitative studies, to be included in the same analysis. It is also consistent with a framework that has been proposed for translating obesity-related evidence into action.12
**Methodology**

**Article feature quality**—Based upon the number of threats to internal/external validity, the studies were rated for quality. This is similar to the approach used in the systematic reviews presented in the *Guide to Community Preventive Services*. A selection of four criteria (method, sampling, analysis and results) was examined to allow an assessment of quality across this broad range of study types and designs. The criteria were rated on a four-point scale ranging from “Good” (1) to “Very Poor” (4). The ratings were then summed across the major article features and the studies ranked according to their relative score. A study was deemed to be of good quality if it achieved a score of 4 or 5, of fair quality if it received a score between 6 and 8, and of poor quality if it had a score of 9 or more. This process allowed the relative strength of the findings in each area of the analysis to be assessed.

**Reliability**

Several steps were undertaken to ensure the fidelity of the findings of this review. All members of the research team, along with several research assistants/coders, met on several occasions to develop and discuss the coding scheme. This allowed for the coders to become intimately familiar with the system, and to develop an awareness of the expectations of the investigators. Second, coders met with the research coordinator on four separate occasions to continue to practise coding. During these meetings, issues were discussed and the coding mechanism fine-tuned. Once the group showed consistency (that is, more than 90% correct coding), they began reviewing studies. Throughout the coding process, bi-weekly meetings were held to share the experiences of the coders as they progressed through their work. Coders frequently communicated with the research coordinator to ensure that a consistent solution to any coding issue was provided. As coding results were submitted, the research coordinator manually checked each finding as it was entered into the overall review database to ensure its validity. Any errors were either corrected immediately or discussed with the coder to determine the correct value.

**Description of Analysis**

The articles collected in this review focused on four behaviour/outcome variables: food/diet/nutrition, physical activity, sedentary behaviour and obesity/healthy weights. Under food/diet/nutrition, reviewers were interested in various aspects surrounding the relationship between food and the environment, such as the mediating effect of a specific setting on dietary outcomes and nutrition. Physical activity included articles exploring environmental features as barriers to or facilitators of being physically active, as did those for sedentary behaviour. Finally, literature in the obesity/healthy weights section concentrated on the effect of environmental contexts on body weight or behaviours that are specifically tied to a body weight outcome.

Basic frequency counts were calculated for all coded variables, including demographic characteristics, settings/sectors, specific environments, study design and quality, and finding directions, as described above. These frequencies were tallied at four levels: overall results (all findings); for each behaviour/outcome variable; for each setting and sector within each of these behaviour/outcome variables; and for each specific environment within each setting and sector. The overall results include all findings and indicate trends
at a more general level; for example, what are some of the specific populations that are assessed by this type of research? At the behaviour/outcome level, trends within each of the four outcome groups can be examined, while numbers at the setting/sector level begin to provide an indication of where the environment–behaviour interactions are taking place. Data at the specific environmental level allow a glimpse into the “on the ground” observations and interventions that researchers have documented. As results are viewed across these four levels, patterns concerning the distribution of populations, broad and specific environments and types of studies can be determined.

Cross-tabulations were performed to elicit more specific information about the associations between key variables at various levels of analysis (see Figure 1). Specifically of interest here were the associations between the environments found in the literature and the behaviours/outcomes outlined above, as well as the associations between these environments and body weight. Of further interest were the associations between behaviours/outcomes and body weight within these urban environments. Cross-tabulations were calculated within and between several layers of data, to illuminate any associations therein; for example, the quality of the studies examining the physical setting within the food/diet/nutrition outcome or the direction of findings relative to the specific environments found within a sector of the physical activity outcome. The detail that these statistics provide is essential to understanding the interactions between the many characteristics and the many environmental levels at which they influence behaviours and body weights.

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**Figure 1**

**Theoretical Model**

- Sectors
- Settings
- Food Intake
- Physical Activity
- Body Weight
Levels of Evidence

Once all studies had been coded and checked for reliability, those that were rated as either an A or B under the Study Design section of the assessment tool, and rated “fair” or “good” according to the quality ratings, were aggregated according to the direction of the findings/outcome and within the various levels of the environment (settings and sectors). Then, a determination of our confidence in the evidence was made as follows: convincing, probable, possible, insufficient or no evidence. These categories for “levels of evidence” are similar to those developed by the World Cancer Research Fund/American Institute for Cancer Research\textsuperscript{15} and recently adapted by Swinburn, Caterson, Seidell and James\textsuperscript{16} in a review of nutrition and obesity. Levels of evidence were determined at two different levels of the environment: size (settings, sectors) and type (physical, socio-cultural, political, economic).

2.2 Stakeholder Survey (Informed Opinion)

Swinburn, Gill and Kumanyika\textsuperscript{12} identify informed opinion of practitioners, stakeholders and policy-makers able to inform judgments on implementation issues as an important type of evidence. Although informed opinion is partly represented in peer-reviewed and grey literature, we recognize that limiting the review to published literature will also limit access to the experience and opinions of decision-makers. In order to address this weakness of a literature review, we conducted an online survey with key stakeholders, decision-makers and policy-makers across Canada.

Informed opinion was sought relative to the following issues and implied questions as delineated by Swinburn and colleagues:\textsuperscript{12} a) points of intervention (what environmental factors are potentially modifiable?); b) range of opportunities for action (what are current relevant initiatives that imply modifiable and feasible strategies?); and c) selection of a portfolio of specific policies, programs and actions (what initiatives would be achievable and have impact?). Specifically, we solicited informed opinion on specific interventions and actions with respect to the following:

- feasibility
- sustainability
- other potential positive or negative effects
- acceptability to stakeholders

Key stakeholder “filter criteria” provide important qualitative context to categorizing promise for potential interventions.\textsuperscript{12}
Stakeholders who attended *Addressing Obesity in Canada: A Think Tank on Selected Policy Research Priorities* in Toronto, Ontario, in October 2005 were contacted to solicit their participation in an online survey. This think tank was attended by over 90 researchers and decision-makers and was hosted by the Heart and Stroke Foundation, the Canadian Population Health Initiative (CPHI), the Canadian Institutes of Health Research (CIHR) and the Chronic Disease Prevention Alliance of Canada (CDPAC). An email letter was sent to all those who attended the symposium. An introduction to our study was made in a letter, and a URL link was provided along with an invitation to fill out an online survey. The questionnaire comprised four questions:

1. From your perspective, list up to 3 (three) factors that are most likely to have an impact on healthy weights in an urban environment.

2. Are the factors listed in Question 1 modifiable by a policy response? Please choose “yes,” “no,” or “not sure” for each factor that you listed in Question 1.

3. List up to 3 (three) policies/programs/initiatives that you know of that exist in/for urban areas to assist populations in achieving healthy body weights.

4. Are you aware of evidence regarding the cost-effectiveness of the policies/programs/initiatives you listed in Question 3? Please choose “yes,” “no,” or “not sure” for each item you listed in Question 3.

The full survey as it appeared online is in Appendix D. Ethics approval for the survey was obtained from the University of Alberta Health Research Ethics Board.
3 Results

3.1 Literature Search and Review Process

The raw literature searches revealed 65,929 articles that fit the search criteria. Following the title scan, 16,967 articles remained (approximately 25% of the total). The abstract scans then eliminated a further 86% of these articles, resulting in 2,349 that were kept. Of these, many required follow-up (that is, the full article was retrieved and re-reviewed) to verify their inclusion, simply because abstracts were often limited in the information they provided. Once the follow-ups were completed, 608 articles remained and were submitted for full review. Of the 608 articles, 355 articles were ultimately kept and assessed following the full review process (see Appendix E for a list of literature included in the data analysis).

3.2 Data: Obesity/Healthy Weights

3.2.1 Overall Findings for Obesity/Healthy Weights

Our systematic review identified 89 articles meeting the inclusion criteria and addressing outcomes related to obesity or healthy weights. These articles included 228 findings that were categorized in terms of the previously described settings and sectors. The following sections will often refer to the “prevalence of obesity” as an outcome of interest. However, it is important to note that many studies used different cut-offs or actually measured the prevalence of overweight or presented changes in body mass index (BMI) as a continuous variable. Consequently, the expression “prevalence of obesity” is used as a common expression in order to simplify the reading of these sections.

Most of the findings were categorized as being part of the micro-environmental level, including the economic setting (27%), the physical setting (24%), the socio-cultural setting (14%) and the political setting (3%); others were categorized at the macro-environmental level, including the economic (23%), socio-cultural (7%) and physical (3%) sectors. No studies were categorized in the political sector.

Overall, the findings were based on a similar proportion of males and females (males only = 20%, females only = 23%, both = 38%), and the majority of studies (65%) did not specify the ethnicity of the population. There was nonetheless some specific attention towards minorities, with 11% and 8% of the findings related to African-Americans and Latinos/Hispanics, respectively. Approximately 50% of the studies addressed obesity and healthy weights in adults and 38% specifically considered children or adolescents.
3.2.2 The Influence of the Physical Setting and Sector on Obesity/Healthy Weights

A high proportion (47%) of studies on the physical setting found no significant association with obesity or healthy weights. Those studies that described a significant association (53%) were split evenly between a positive (27%) and negative association (25%).

Built Environment and Land-Use Mix

Approximately half of the physical setting findings (57%) were related to the built environment, such as intersection density, residential density and land-use mix. Most of these findings come from three studies.\cite{17,18,19} The inconsistencies in the results mentioned previously can in part be explained by ethnicity\cite{19} or by sex.\cite{17} In this regard, it may be very difficult to generalize the results of individual studies. For example, in a study by Frank et al.\cite{19} based on a cross-sectional study of the city of Atlanta, a greater land-use mix among residential, commercial, office and institutional was associated with a lower prevalence of obesity among Caucasians, but did not reach statistical significance among African-Americans. This study also suggested that higher residential density and intersection density were associated with a reduced prevalence of obesity. It was proposed that these associations with obesity are mediated by greater amounts of walking per day and less time spent in a car. Surprisingly, other studies have shown that access to a car is associated with a lower prevalence of obesity.\cite{20} However, as discussed in the following section on the economic setting, this may be related to socio-economic status (SES).

Walkability and Availability of Facilities

Eleven findings from five studies\cite{20,21,22,23,24} were somewhat equivocal in their support for the association between body weight and walkability and access to facilities. According to a study involving focus groups,\cite{23} another element of the physical setting that could influence children’s BMIs in urban settings was the presence of a safe place to play in low-income neighbourhoods. On the other hand, a cross-sectional study in Cincinnati\cite{21} found no association between child overweight and proximity to playgrounds, proximity to fast food restaurants or level of neighbourhood crime.

School Environment

Within the school environment, 16 findings from nine studies (for example, Arbeit et al.,\cite{25} Anderson, Shapiro and Lundgren,\cite{26} Robinson\cite{27} and Sahota et al.\cite{28}) were identified. The majority of these findings (63%) revealed no association between the environment and obesity. For instance, Arbeit et al.\cite{25} found that the Heart Smart cardiovascular school health promotion program, which included changes in curriculum, school lunches and physical education, resulted in no overall change in BMI. The strengths of this study include its randomized design (schools were the unit of randomization). However, children who showed improvements in eating choices and in fitness experienced greater improvements in cardiovascular risk factors such as cholesterol.\cite{25} While few studies were found in this category, it is important to note that several other studies have assessed the impact of various school-based programs on BMI. These studies were likely not retrieved by our search strategy for a variety of reasons, including the fact that they did not specify an urban setting.
Results

Few findings were available describing the association between obesity/healthy weights and the physical sector. Six of the seven findings in this sector came from a study by Lopez.29 The data in this study were based on sprawl index values calculated, according to the 2000 census, for over 300 metropolitan areas across the United States. After controlling for gender, age, race/ethnicity, income and education, an increase in urban sprawl was associated with an increased prevalence of overweight and obesity.29

3.2.3 The Influence of the Economic Setting and Sector on Obesity/Healthy Weights

Within the economic setting, almost all (87%) of the findings were classified as some combination of SES, income, education or employment status. In general, studies suggested that neighbourhoods, municipalities or areas characterized as deprived30–32 or low SES33–36 have a greater prevalence of overweight/obesity. Some found this association stronger in females compared to males and in older adults compared to younger adults (cut-off was 49 years of age).33 Our review is consistent with the interpretation of the literature by two recent review articles.37, 38 In fact, Booth et al.38 suggest that “lower SES neighbourhoods are a primary concern” (p. S116) in relation to obesity.

The relationship between lower SES and an elevated BMI has also been observed in young children and adolescents.39–42 Of particular interest in the Canadian context, Moffat and colleagues presented the results of a study conducted in Hamilton, Ontario, among children (ages 6 to 10 years) attending elementary schools in three neighbourhoods differing by SES.41 This study revealed that in the two low-SES schools compared to the high-SES school, there were approximately twice as many children in the overweight/obese category.41 However, there is some evidence that this may not be a universal finding. For example, among a sample of children living in the Mexico City area, those living in a middle-income town had a higher risk of being obese when compared to those living in a low-income town.43

As for the SES findings, education also demonstrated consistent associations with obesity within the economic sector. A lower education level was associated with higher BMI, independent of other SES factors among Swedish adults.44 Parental education level also appears to be a predictor of obesity in young adulthood.45

An inconsistent pattern of findings is observed for economic sector variables in association with obesity and healthy weights. Ten of 53 findings (19%) presented a positive (beneficial) association with obesity, while 21 (40%) showed a negative association. The impact of SES and social position is evident at the economic-sector level, with approximately half of the findings (52%) suggesting a significant negative association. As opposed to the setting level, SES in the sector level reflects the SES of a community or neighbourhood and not individual SES.
3.2.4 The Influence of the Political Setting and Sector on Obesity/Healthy Weights

Five studies with a total of seven findings were classified in the political setting. Five of the seven findings (71%) were categorized as having no significant association with obesity and healthy weights. The two other findings were from a workplace intervention and a school intervention and suggested positive associations with obesity and healthy weights.

A previous review article identified community-based interventions aimed at controlling cardiovascular disease risk factors such as body weight, including the North Karelia trial in Finland, the Stanford three-community and the Stanford five-community studies, the Minnesota Heart Health Program and the Pawtucket Heart Health Program. According to this review, some trials reported positive results for change in blood pressure or cholesterol, but none showed a convincing effect on obesity.

No studies on the political sector were identified.

3.2.5 The Influence of the Socio-Cultural Setting and Sector on Obesity/Healthy Weights

Similar to studies on the physical setting, studies on the socio-cultural setting present a broad range of findings. A total of 33 findings were extracted from 14 studies in relation to socio-cultural settings. Among these findings, approximately 30% showed no significant association with obesity or healthy weights.

The evidence for the influence of ethnicity or cultural assimilation on obesity and healthy weights was equivocal. In some studies, being African-American or Mexican-American was associated with a higher prevalence of obesity. The role of assimilation (also described as acculturation) and family attitude towards assimilation as a predictor of obesity has also been examined. Cultural assimilation was associated with more obesity in Mexican-American men, whereas the opposite was true in Mexican-American women. Another study suggested that the association between acculturation and BMI is weak and subject to cultural differences.

The findings from the socio-cultural setting that showed the most consistent associations with obesity are ones relating to advertising and the media. Of the nine findings in advertisement and media, seven indicated a significant positive association with obesity while two suggested no association. These nine findings have been extracted from two studies. Television advertisement can favour an increased consumption of food, particularly in overweight/obese children. On the other hand, television and the media also have the potential to have a positive impact on body weight. In one study, a short-term mass media program combined with self-help manuals and support groups led to significant short-term weight loss. However, it is important to note that the media intervention alone was not successful.
Only one study addressed the notion of safety.\textsuperscript{21} In this study of urban (Cincinnati) low-income pre-schoolers, overweight was not associated with the level of neighbourhood crime.\textsuperscript{21}

Although fewer studies were available for the socio-cultural sector, most findings (94\%) were statistically significant. Eight studies were identified in the socio-cultural sector, with a total of 17 findings. These findings indicate that low education level in adults,\textsuperscript{53} low parental education level in children,\textsuperscript{44} greater television viewing,\textsuperscript{55} more sedentary leisure\textsuperscript{23} and Mexican-American ethnicity\textsuperscript{56} were associated with a higher prevalence of overweight or obesity.

3.2.6 Behaviours in Relation to Obesity/Healthy Weights Within Urban Environments

Sections 3.2.1 to 3.2.5 provided an overview of the influence of the urban environment on obesity or healthy weights. However, changes in body weight do not occur in isolation; they occur as a result of changes in energy balance (energy intake versus energy expenditure). Although other variables can influence this equilibrium, physical activity and nutrition behaviours are the main variables of interest. The present section will describe the environmental influences on obesity while considering the potential mediating (explanatory) role of physical activity, sedentary behaviour or food/diet/nutrition behaviours within the same study. The study designs do not allow the establishment of a causal relationship between behaviour and obesity outcomes.

Only 36 studies including 185 findings (approximately 14\% of the total number of findings) considered obesity outcomes as well as behavioural outcomes. Compared to those studies and findings that did not include weight and behaviours, the findings from combined studies were more likely to be experimental (27\% versus 12\%, $\chi^2 [3, 1340] = 43.02, p < 0.0001$) and to show no association/effect between the environment and body weight (47\% versus 30\%, $\chi^2 [3, 231] = 7.84, p = 0.05$).

Several of these studies were conducted in school settings. Heart Smart, Know Your Body and Child and Adolescent Trial for Cardiovascular Health (CATCH) are three well-known school intervention studies.\textsuperscript{25,57-61} All three of these interventions had a physical activity and nutrition component with significant changes to the school curriculum, while some also integrated the parents and school food services into the intervention. In general, these studies found no significant impact on obesity, despite significant improvements in the children’s behaviours and knowledge. The larger and more consistent improvements in behaviour seem to have occurred for nutritional behaviours.

Other studies considered the role of SES in relation to obesity and behaviour-related outcomes. For instance, lower parental social class was associated with lower physical activity and greater obesity in adolescents; these associations generally remained through the adolescents’ transitions to young adulthood.\textsuperscript{62} In other studies that found lower SES to be associated with a greater prevalence of obesity, members of lower-SES groups were less likely to maintain a healthy diet and participate in physical activity.\textsuperscript{36,63}
Several studies examined the influence of urban design on behaviour and obesity outcomes. Apart from the findings of Kelly-Schwartz et al., these studies consistently showed that factors that promote obesity (such as urban sprawl, low intersection density, low residential density and low land-use mix) tend also to favour sedentary behaviour and lower physical activity levels. It is important to re-emphasize that although behaviours and obesity may be related to each other, the direction of the relationship (obesity leads to more sedentary behaviour or sedentary behaviour leads to obesity) as well as the causality of the relationship cannot be established from these studies.

### 3.2.7 Summary of Obesity/Healthy Weights

In summary, while most findings are derived from cross-sectional studies, some of the associations between the urban environment and obesity appear to be more consistent than others. A lower SES has consistently been shown to be associated with increased obesity in adults and in children. However, not surprisingly, no studies have assessed the impact of an intervention to improve SES on obesity. Therefore a causal relationship between SES, per se, and obesity cannot be established or denied. Although few studies are available to support this (for example, Ersoy et al.), it appears that the influence of SES on obesity can be mediated, at least in part, by both physical activity and nutrition behaviours.

While many studies examined the physical and socio-cultural settings, the findings varied, with a greater-than-expected proportion of non-significant associations (30%). Some of the more commonly observed significant associations with obesity were related to the built environment (for example, intersection density, land-use mix) and the use of media/advertising. We found little evidence to support school-based interventions for the reduction of obesity, even though these interventions may improve physical activity and nutrition behaviours. Furthermore, although ethnicity and the degree of acculturation may be associated with obesity in some cases, this association has not consistently been observed. Few studies were available on the policy setting/sector.

Although little experimental evidence exists to support this notion, interventions aimed at improving SES and education levels may help address disparities in obesity. Furthermore, there seems to be a need for a better understanding of how the influence of the urban environment results in changes in the prevalence of obesity. This may be particularly true for the school setting, where several interventions have improved physical activity and nutrition knowledge/behaviours without having a significant impact on obesity.
3.3 Data: Food, Diet and Nutrition

3.3.1 Overall Findings for Food, Diet and Nutrition

Overall, 349 findings from 147 studies involved associations between urban environments and food, diet and nutrition.

Most of the literature (77%) dealt with micro-environments (settings). Only 80 findings (23%) addressed macro-environments (sectors). Socio-cultural environments were explored most frequently (43%), followed by economic environments (32%), physical environments (22%) and political environments (3%).

Overall, the findings were based on a similar proportion of males and females (males only = 14%, females only = 19%, both = 40%, not specified = 28%). The largest proportion of study findings addressed diet and nutrition behaviour in adults (47%), including 7% in older adults. An additional 36% of findings addressed diet and nutrition behaviour in children and youth, including young children (17%) and adolescents (19%).

The majority of findings (71%) did not specify the ethnicity of the population studied. There was nonetheless some specific attention towards minorities, with 12% and 6% of the findings specifically related to African-Americans/Blacks and Latinos/Hispanics, respectively. Only one study (two findings) focused on an Aboriginal population.

Most findings (65%) did not specify the SES of the population studied, while 13% used income, 8% used education and 6% used employment as indicators of SES.

3.3.2 The Influence of the Physical Setting and Sector on Food, Diet and Nutrition

Forty-one studies examined physical settings (for example, availability of/accessibility to food in schools, neighbourhoods, restaurants), for a total of 71 findings. The majority (75%) found associations (21% negative and 54% positive) between physical settings and food intake; the remaining 25% found no association. More specifically, of the 71 findings described in the physical setting, 58% dealt with school environments, 14% related to geographic access/neighbourhood design and 20% involved restaurants or stores; the remaining 9% were classified as “other” environments, such as home environments.

Schools

Of the 41 findings from 23 studies dealing with school environments, most (76%) showed associations (12% negative; 63% positive) between school environments and food, diet and nutrition. Only one study was a review, six studies were observational and the remainder (n = 15) dealt with school-based interventions. In one observational study, consumption of more meals at school was associated with a lower total dietary fat intake, a positive association. Two observational qualitative studies dealt with students’ and parents’ perceptions of school food environments, and both studies revealed that school environments with perceived unhealthy food choice availability negatively influenced food choices.
The bulk of the school environment studies and findings dealt with the influence of environmental interventions on food intake. All of these studies manipulated some aspect of the physical environment such as availability of healthy choices in vending machines (for example, Hoerr and Louden\textsuperscript{69} and Crawford\textsuperscript{70}) or point-of-purchase nutrition information (for example, French et al.\textsuperscript{71} and Buscher, Martin and Crocker\textsuperscript{72}), and all had at least some positive effects on food intake, either increasing healthy food choices or decreasing unhealthy alternatives. Only five studies (six findings) found no associations between the intervention and change in dietary behaviour. For example, using family-style versus cafeteria-style food service had no effect on energy intake.\textsuperscript{73} In two studies that had primarily positive effects,\textsuperscript{28, 69} negative associations were found in only two instances. Specifically, despite overall positive change in diet, Sahota et al.\textsuperscript{28} found decreased fruit consumption within the intervention group, and Hoerr and Louden\textsuperscript{69} found a negative impact on total snack sales when healthy foods were offered in vending machines. Studies comparing the impact of school interventions on food, diet and nutrition found no effect in lower-SES school environments but positive effects in higher-SES schools.\textsuperscript{57, 59} In some cases, changes in school environments were not associated with behaviour changes, but were associated with changes in food sales and healthier food availability.\textsuperscript{74}

**Geographic Access/Neighbourhood Design**

In examining geographic access to food in urban environments, only six studies were found. Five studies examined\textsuperscript{25-28} or reviewed\textsuperscript{37} relationships between local availability of food and socio-economic status of residents, while only one study connected neighbourhood environment with dietary intake/quality.\textsuperscript{79} In all U.S. studies, greater access to high-energy-density foods (for example, fast food),\textsuperscript{75, 76} lower access to healthier food (for example, supermarkets)\textsuperscript{27, 77} and lower availability of stores stocking healthy foods\textsuperscript{78} were observed in less affluent or marginalized neighbourhoods. Although relationships among geographic access to food outlets, purchase of food and dietary intake were not established in most of these studies, the proximity of supermarkets and other food retail outlets was shown to be associated with a positive influence (although no such association was found for grocery stores) on dietary quality\textsuperscript{79} in a single study of pregnant women.

**Restaurants/Stores**

Inequitable geographic access to various food outlets does not necessarily mean that the food available at those outlets limits or promotes certain types of choices and predicts dietary quality. However, consistent with assumptions implied by inequitable geographic access, two U.S. studies investigated the availability of food meeting nutrition recommendations in divergent neighbourhoods and found lower availability of healthy foods in stores\textsuperscript{28} and restaurants\textsuperscript{73} in economically disadvantaged neighbourhoods. No such association was found in a single Australian study.\textsuperscript{80}

Two qualitative studies\textsuperscript{68, 81} examined people’s perceptions of environmental barriers to making healthy food choices and both found that people perceived the availability of fast food to negatively influence food choices, while Chatterjee et al.\textsuperscript{81} also found that people’s perceived availability of healthy food positively influenced food choices.
Two studies investigated the relationship between food availability in restaurants and food intake. For children, the number of meals consumed in restaurants negatively affected diet quality.\(^{66}\) Availability of fruit, juice and vegetables at restaurants positively influenced food intake.\(^{82}\) In stores, however, no associations were found between food availability and consumption in two studies. Availability of fruit, juice and vegetables at local stores showed no association with their consumption.\(^{82}\) Availability of low-fat foods at stores in disadvantaged communities was not associated with low-fat eating patterns.\(^{83}\)

Only one study\(^{84}\) intervened in food outlets by using shelf labelling in stores to promote healthier choices, and the intervention positively influenced food purchase behaviour.

**Physical Sector**

With respect to the influence of the physical environment on food intake, only one U.S. study\(^{85}\) addressed larger structural physical sectors, finding a positive association between urbanization and dietary quality (micronutrient intake) through secondary analysis of the United States Department of Agriculture’s (USDA) 1987–1988 National Food Consumption Survey.

### 3.3.3 The Influence of the Economic Setting and Sector on Food, Diet and Nutrition

#### Economic Sector—Socio-Economic Status

With respect to the influence of the economic environment on food, diet and nutrition, 26 studies and 43 findings examined economic sectors such as SES of populations (income, education and employment). The majority of findings (72%) reported associations (7% negative and 65% positive) between economic sectors and food, diet and nutrition; the remaining 28% showed no associations.

More specifically, studies that derived composite measures of SES and deprivation overwhelmingly (70% of findings) supported the idea that lower SES and deprivation are associated with poor dietary quality.\(^{63, 83, 86–95}\) Only one study (two findings)\(^{84}\) found negative associations and only four studies\(^{91, 95–97}\) found no associations. When education was used as a proxy for SES, similar associations (75% positive; 25% no associations) were found.\(^{89, 92, 98–102}\) Weaker associations were found when income (57% positive, 43% no associations) alone was used as an indicator of SES.\(^{92, 99, 102–104}\) Only two findings used unemployment as an indicator of SES, and findings were equally split between positive associations\(^{105}\) and no associations.\(^{106}\)

#### Economic Settings

A greater quantity of literature (68 findings) examined microeconomic settings, such as affordability and neighbourhood/local socio-economic status, as compared to macroeconomic sectors. The majority (76%) found associations (24% negative and 53% positive) between economic settings and food, diet and nutrition variables; the remaining 24% found no associations.
One of the largest shares of the evidence (27% of findings) deals with the cost of food. At the neighbourhood level, food costs have not been shown to be higher in disadvantaged neighbourhoods, although lower incomes in such neighbourhoods may deter healthier choices. Most findings (56%) showed associations between price of food and consumption, with affordability having the most consistent influence (for example, Horowitz et al. and Donkin et al.\textsuperscript{89}). Studies in which the intervention was manipulation of food costs had inconsistent findings; some found price decreases of healthy foods increased consumption (for example, French et al.\textsuperscript{107} and Horgen and Brownell\textsuperscript{108}) while others found no effect of pricing in a work-site cafeteria.\textsuperscript{109}

While both education and employment status at the local (neighbourhood) level consistently showed associations with food, diet and nutrition variables (for example, Oygard and Klepp\textsuperscript{110} and Fehily, Phillips and Yarnell\textsuperscript{111}), studies using income and composite measures of SES were divided between those that showed associations (such as Forsyth, Macintyre and Anderson\textsuperscript{112}) and those that did not\textsuperscript{113, 114} (69% versus 31%).

3.3.4 The Influence of the Political Setting and Sector on Food, Diet and Nutrition

Ten studies examined the influence of political settings on food, diet and nutrition, with a total of 10 findings. Associations between political settings and food, diet and nutrition were evident in 60% of findings (50% positive, 10% negative); 40% of findings showed no associations.

The vast majority of studies dealt with school as a political setting, with interventions in school food policy accounting for 60% of the findings. Interventions in work-site policy (for example, work-site counselling, work-site cafeteria interventions) accounted for 40% of the findings.

As interventions in schools would typically require a policy to initiate change in the types of food available (an influence on the school’s physical environment) or the price of food sold within the school (an influence on the school’s economic environment), there is some overlap in environmental context in the discussion of school environmental interventions. Of the six findings dealing with school environments, the majority (67%) found associations (all positive) between school policy and food, nutrition and diet variables. Positive effects on consumption of healthier foods (lower fat or increased fruit and vegetables) were associated with comprehensive policy or educational/promotional interventions.\textsuperscript{115–118}

No studies were found that addressed the influence of the political sector on food, diet and nutrition.
3.3.5 The Influence of the Socio-Cultural Setting and Sector on Food, Diet and Nutrition

The majority of studies and findings related to food, diet and nutrition explored the socio-cultural environment (150/349; 43% of findings).

Socio-Cultural Settings

Forty-nine papers and 119 findings examined socio-cultural settings and associations with food, diet and nutrition. The majority (71%) found associations (20% negative, 50% positive and 1% U-shaped) between socio-cultural settings and food, diet and nutrition variables; the remaining 29% found no associations.

The majority (53%) of findings examined home/family environments such as family composition (single- versus dual-parent; for example, Moynihan et al.119), perceived norms of family members (for example, Oygard and Klepp110) or role modelling and availability of food in the home120 and their influence on food, diet and nutrition variables. Not all food, nutrition and dietary variables were comparably influenced; associations were found for 71% of the 63 findings (51% positive; 21% negative). Three studies58,121,122 applied interventions (school-based parental education or social support) to improve food, diet and nutrition behaviours within the family environment and all were associated with positive changes in most of the diet variables.

Five studies with 17 findings examined the role of ethnicity and culture on food, diet and nutrition variables such as cultural food or body size preferences (for example, Frank et al.123). Most found associations (59%; 12% negative, 41% positive and 6% U-shaped). One study124 engaged African-American families in a culturally appropriate intervention to improve dietary behaviours and was successful in modifying 50% of targeted behaviours.

Ten studies31, 89, 108, 125–131 with 21 findings examined media and advertisements at the local level (for example, placing health messages on restaurant menus, local media-based weight control programs or children’s preferences for advertised foods). Of the 21 findings, 90% showed associations (52% positive and 38% negative) between media exposure and food, diet and nutrition variables.

Socio-Cultural Sectors

With respect to the influence of the socio-cultural environment on food, diet and nutrition, 18 papers and 31 findings addressed socio-cultural sectors such as ethnicity/culture/acculturation and media. The majority (77%) found associations (48% negative, 26% positive and 3% U-shaped) between socio-cultural sectors and food, diet and nutrition; the remaining 23% found no associations. More specifically, studies that described the impact of ethnicity and culture on food, diet and nutrition variables overwhelmingly supported the idea that acculturation to a Western lifestyle had effects, predominantly negative (69% of findings), on immigrants’ food, nutrition and dietary habits31, 96, 132–134.
At the sector level, the role of media in promoting a socio-cultural obesogenic environment is less clear, with 50% of findings from only two studies showing association between media exposure and food consumption (for example, Green et al.\textsuperscript{133}), although one recent, well-designed qualitative study\textsuperscript{68} found that parents and children associated “junk food” advertising with an environment unsupportive of health behaviours.

3.4 Data: Physical Activity

3.4.1 Overall Findings for Physical Activity

The review included 176 studies with 712 findings related to physical activity and some aspect of the urban environment.

Most of the findings involved both males and females (33%), while another 27% were specific to females and 13% were specific to males. Although 5% of the physical activity findings involved Caucasian/White participants and another 8% involved African-Americans, the majority had no specific designation of ethnicity or race. In terms of age, adults (38%) were the most likely participants, with adolescents (16%), children (12%) and older adults (8%) accounting for smaller proportions of the findings.

Most of the physical activity findings (82%) were clustered among the settings, while the sectors accounted for a much smaller proportion (18%). Specifically, 53% of findings were in physical settings, 19% in socio-cultural settings, 2% in political settings and 8% in economic settings. Within the sectors, economic sectors included the largest proportion of findings at 10%.

3.4.2 The Influence of the Physical Setting and Sector on Physical Activity

Fifty-nine percent (59%) of the findings within the physical setting showed some association or effect between the environment and physical activity. Forty-two percent (42%) of the findings were related to urban design, while another 26% had to do with facility access. Approximately 50% of the findings in those two categories combined showed positive associations/effects between features of the urban environment and physical activity. These findings originated from a number of studies (for example, Craig et al.;\textsuperscript{135} De Bourdeaudhuij, Sallis and Saelens;\textsuperscript{136} Frank et al.;\textsuperscript{137} Humpel et al.\textsuperscript{138} and King et al.\textsuperscript{139}) and appear to document a fairly consistent relationship between environment and behaviour. However, apart from a few studies (for example, Craig et al.;\textsuperscript{135} Frank et al.;\textsuperscript{137} King et al.;\textsuperscript{139} Estabrooks, Lee and Gyurcsik\textsuperscript{140} and Giles-Corti and Donovan\textsuperscript{141}), many only assessed perceptions of the environment in relation to physical activity. While this may be considered a limitation, a recent meta-analysis\textsuperscript{62} found that the perceived presence of physical activity facilities, sidewalks, shops and services and perceiving traffic not to be a problem were all positively associated with physical activity.

Fewer findings (n = 18) from only 10 studies were available for the physical sector. Similar to those for the physical setting, support was found for the role of the built environment in relation to physical activity.\textsuperscript{68,142,143} For instance, Sin et al.\textsuperscript{144} found that an important barrier to exercise among a group of elderly Korean-Americans living in Seattle was the availability of transportation.
3.4.3 The Influence of the Economic Setting and Sector on Physical Activity

Of the 55 findings in the economic settings, 35 (64%) showed some association between the urban environment and physical activity. Not surprisingly, a distinct association emerged between SES and physical activity, with lower-income individuals reporting more barriers and less participation in physical activity.\(^{145,146}\) Furthermore, it appears that the availability, perception and use of facilities and trails in neighbourhoods are moderated by SES.\(^{145,147}\) These findings could be one explanation for the very common SES gradient that is observed for physical activity.\(^{148}\)

Though more findings (n = 72) were available for the economic sector, 65% showed some association between the environment and physical activity. For instance, in a cost-benefit analysis of using bike/pedestrian trails in Lincoln, Nebraska, Wang et al.\(^{149}\) found that for every US$1 investment in trails for physical activity, US$2.94 in direct medical benefit would be accrued.

3.4.4 The Influence of the Political Setting and Sector on Physical Activity

The political setting included 17 findings, 77% of which showed an association between the urban environment and physical activity. This was the least supportive setting or sector. Almost half of the findings (47%) were from intervention studies. Interestingly, changes in school environment, curricula, policies and practices were associated with increases in both moderate and vigorous physical activity among a group of ninth-grade girls.\(^{150}\)

The political sector had even fewer findings (n = 4) from just three studies.\(^{143,151,152}\) All findings indicated a positive association between the environment and physical activity. For instance, Pucher\(^{143}\) attributed a recent resurgence in bicycling in Germany entirely to “public policies that have greatly enhanced the safety, speed, and convenience of bicycling.”

3.4.5 The Influence of the Socio-Cultural Setting and Sector on Physical Activity

The socio-cultural setting was second to the physical setting in terms of the number of findings (n = 135), approximately 60% of which showed some association between the urban environment and physical activity. While social support relations made up more than half of the findings (n = 72), suggesting this is an area of interest, 39% of those findings were of no association. Studies investigating ethnicity and culture showed a more consistent pattern of associations between environment and physical activity.\(^{145,153,154}\) For instance, in a study of 117 Chinese students from grades 9 through 12 in New York City, Yu and Berryman\(^{154}\) found that acculturation had a significant positive correlation with total level of recreation participation.

The socio-cultural sector included 35 findings, with 23% of those showing no association between the urban environment and physical activity. Not surprisingly, physical activity was negatively associated with the extent to which cars were culturally accepted in Australia\(^{155}\) and positively related to the popularity of the green movement in Germany.\(^{145}\)
3.5 Data: Sedentary Behaviour

The review included 13 studies with 36 findings related to sedentary behaviour (for example, TV viewing, time spent in car) and some aspect of the urban environment.

Most of the findings involved adults (47%). The distribution of findings by sex was similar for males (31%), females (33%) or both (31%). Ethnicity (50%) was indistinguishable for the majority of the findings. Approximately 25% of the findings on sedentary behaviour showed no association.

The physical (53%) and socio-cultural (22%) settings accounted for almost all of the findings. Thirty-two percent (32%) of the physical setting findings showed no association with sedentary behaviour, while another 53% showed a negative association. For socio-cultural settings, 13% of the findings were of no association, with the other 87% showing a positive association. Overall, it appears that there may be some association between some aspects of urban settings and sedentary behaviour, but the findings and studies are too few to make any further meaningful analysis.

3.6 Levels of Evidence for Relationships Between Urban Environments and Obesogenic Behaviour or Body Weight

Findings from observational and experimental studies that were deemed to be of fair to good quality were aggregated within type and level of environment according to the direction of the finding. Because we were interested in determining if any association/effect existed between the environment and behaviour or body weight, regardless of direction, our focus was on the findings of no association. Specifically, we made a determination of our confidence in the evidence based upon the proportion of findings with no associations. The fewer findings of no association, the more confident we were in the evidence (that is, Convincing <10%, Probable 10% to 29%, Possible 30% to 49%, Insufficient 50% to 89%, No Evidence ≥90%). If there were fewer than 10 findings for a particular relationship, we downgraded our level of confidence to the next level. For instance, if there were only nine findings with less than 10% no associations, our level of confidence was categorized as probable instead of convincing.

For the observational findings, we concluded that the evidence was probable for diet and sedentary behaviour for settings overall (see Table 2). The evidence was probable for diet, sedentary behaviour and obesity/healthy weights within the socio-cultural settings; probable for diet, physical activity and obesity/healthy weights in the economic settings; and probable for diet within the physical settings. For sectors, the evidence was probable for diet and physical activity overall. The evidence was probable for diet, physical activity and obesity/healthy weights within the socio-cultural sectors; probable for diet, physical activity and sedentary behaviour in the economic sectors; and probable for physical activity within the physical sectors. We had less confidence in the evidence for sedentary behaviour in relation to sectors.
Results

Table 2
Levels of Evidence\textsuperscript{i} for Observational Findings\textsuperscript{ii}

<table>
<thead>
<tr>
<th>Environment Type</th>
<th>Food, Diet and Nutrition</th>
<th>Physical Activity</th>
<th>Sedentary Behaviour</th>
<th>Body Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>Probable</td>
<td>Possible</td>
<td>Probable</td>
<td>Possible</td>
</tr>
<tr>
<td>Settings</td>
<td>Probable</td>
<td>Possible</td>
<td>Probable</td>
<td>Possible</td>
</tr>
<tr>
<td>Physical</td>
<td>Probable</td>
<td>Possible</td>
<td>Probable</td>
<td>Possible</td>
</tr>
<tr>
<td>Economic</td>
<td>Probable</td>
<td>Probable</td>
<td>No evidence</td>
<td>Probable</td>
</tr>
<tr>
<td>Political</td>
<td>No evidence</td>
<td>Possible</td>
<td>No evidence</td>
<td>No evidence</td>
</tr>
<tr>
<td>Socio-cultural</td>
<td>Probable</td>
<td>Possible</td>
<td>Probable</td>
<td>Probable</td>
</tr>
<tr>
<td>Sectors</td>
<td>Probable</td>
<td>Probable</td>
<td>Possible</td>
<td>Possible</td>
</tr>
<tr>
<td>Physical</td>
<td>Possible</td>
<td>Probable</td>
<td>No evidence</td>
<td>Possible</td>
</tr>
<tr>
<td>Economic</td>
<td>Probable</td>
<td>Probable</td>
<td>Probable</td>
<td>Possible</td>
</tr>
<tr>
<td>Political</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
</tr>
<tr>
<td>Socio-cultural</td>
<td>Probable</td>
<td>Probable</td>
<td>No evidence</td>
<td>Probable</td>
</tr>
</tbody>
</table>

Apart from diet, there appears to be little evidence of experimental effects on obesogenic behaviour and body weight (see Table 3). Within diet, it is only at the settings level where there is any evidence of experimental effects. Specifically, physical and economic settings appear to show some promise for effective interventions.

Table 3
Levels of Evidence\textsuperscript{i} for Experimental Findings\textsuperscript{ii}

<table>
<thead>
<tr>
<th>Environment Type</th>
<th>Food, Diet and Nutrition</th>
<th>Physical Activity</th>
<th>Sedentary Behaviour</th>
<th>Body Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>Probable</td>
<td>Possible</td>
<td>Insufficient</td>
<td>Insufficient</td>
</tr>
<tr>
<td>Settings</td>
<td>Probable</td>
<td>Possible</td>
<td>Insufficient</td>
<td>Insufficient</td>
</tr>
<tr>
<td>Physical</td>
<td>Probable</td>
<td>Possible</td>
<td>Insufficient</td>
<td>Insufficient</td>
</tr>
<tr>
<td>Economic</td>
<td>Probable</td>
<td>Possible</td>
<td>No evidence</td>
<td>No evidence</td>
</tr>
<tr>
<td>Political</td>
<td>No evidence</td>
<td>Insufficient</td>
<td>No evidence</td>
<td>No evidence</td>
</tr>
<tr>
<td>Socio-cultural</td>
<td>Possible</td>
<td>Possible</td>
<td>No evidence</td>
<td>No evidence</td>
</tr>
<tr>
<td>Sectors</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
</tr>
<tr>
<td>Physical</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
</tr>
<tr>
<td>Economic</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
</tr>
<tr>
<td>Political</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
</tr>
<tr>
<td>Socio-cultural</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
<td>No evidence</td>
</tr>
</tbody>
</table>

\textsuperscript{i} Refers to proportion of findings with no association. Probable = 10% to 29%; possible = 30% to 49%; insufficient = 50% to 89%; no evidence ≥90%.

\textsuperscript{ii} Include studies of “fair” and “good” quality.
Overall, we have more confidence in observational findings, particularly at the settings level for diet and sedentary behaviour. Somewhat surprising was the lack of evidence for effective environmental interventions to address obesogenic behaviour and body weight in an urban context.

### 3.7 Policy Context

To get a sense of the policy context in which urban environmental influences of obesity operate, we reviewed a limited number of summary policy documents generated within the Canadian context. These documents can be divided into the following categories: peer-reviewed publications, literature syntheses and reviews, summary reports and expert fora. A total of 10 documents were reviewed (see Appendix F). The analysis of these documents has three primary foci: issue framing, results and recommendations. The intention is to link these more broadly focused documents to our synthesis findings from the urban obesity/healthy weights literature.

#### 3.7.1 Issue Framing

Since 1997, when experts gathered at the first World Health Organization (WHO) Expert Consultation on Obesity, overweight and obesity have been recognized as “a rapidly growing threat to the health of populations”\(^\text{156}\) on a global scale.\(^\text{156, 157}\) In some cases, the term “epidemic”\(^\text{156}\) was used to characterize the issue. A number of the documents broadened the definition of the problem by identifying both overweight and underweight extremes and associated behaviours as equally important. For example, Health Canada\(^\text{158}\) defined “weight problems” to include eating disorders, weight preoccupations and negative body image, and not just excess weight. Excessive dieting resulting from the promotion and societal reinforcement of unhealthy body images was seen as a particular problem.\(^\text{158, 159}\)

Increased sedentary activity associated with technological advancements was also identified as a contributing factor. Children, in particular, were identified as an at-risk population requiring immediate and significant attention.

Within this context, the growing threat that overweight and obesity poses for the children of the world has been identified as a major policy issue. The rising rates of overweight and obesity among children, in Canada and worldwide, over the past 20 years have significant public health implications. Recent thinking suggests that “priority should be directed at the prevention of obesity in infants and children.”\(^\text{160}\)

While most of the existing and emerging research has focused on developing a better understanding of the determinants and root causes of the disease,\(^\text{161}\) some recent research has also focused on possible solutions, with varying degrees of supportive evidence.\(^\text{162}\) Implicit in the existing and emerging knowledge about obesity in general, and childhood obesity specifically, is increasing recognition of the complexity of the issue and the need for the coordinated involvement of a range of policy actors across sectors and settings to link independent policies and processes.\(^\text{157, 161, 163}\) Leadership from health agencies at federal, provincial/territorial and local levels has been identified as “key to implementing integrated, multisectoral, obesity prevention strategies” because of their unique potential
for cross-sector analysis of the costs and benefits of public policies.\textsuperscript{162} The public policy environment is “frequently cited as a critical location for solutions to the obesity epidemic.”\textsuperscript{163} An adequate understanding of the structures and processes through which public policies have either a positive or negative impact “needs to be captured in order to inform and inspire those responsible for policy.”\textsuperscript{163}

Obesity is associated with a number of health\textsuperscript{160} and economic consequences. Although a large number of policy responses have been identified, relatively few have been systematically tested. Thus, in addition to a gap in knowledge about the complex relationships among factors contributing to obesity, there is also a knowledge gap in the impact of possible policy responses.

\subsection*{3.7.2 Possible Policy Responses\textsuperscript{iii}}

Given that obesity is affected by a complex set of personal and environmental factors, the possible policy responses are broad and diverse. Although most documents did not attempt to prioritize possible policy responses, the Groupe de travail provincial sur la problématique du poids (GTPPP)\textsuperscript{159} suggested that a useful starting point might be the creation of multidisciplinary teams to address chronic diseases at the local, regional and provincial levels. Political will was seen as a major factor in ensuring that progress is made.

Appendix G summarizes identified policy options synthesized from a variety of Canadian documents. Policy options are categorized according to the environment, the types of policy instruments (regulatory, expenditure-based, procedural or information-based) and influence on obesogenic behaviour (diet, physical activity) or body weight. These policy options, cross-referenced with levels of evidence from this review, suggest that sufficient evidence exists to justify the following possible policy responses:

\section*{Economic Environments}

\begin{itemize}
  \item Policies that promote economic access to healthy food, such as production incentives and a price structure for food that favour low-energy and nutrient-dense foods;\textsuperscript{158, 164}
  \item Policies that promote economic access to physical activity, such as fiscal measures involving tax reductions for fees related to participation in sports,\textsuperscript{159} removal of sales tax from exercise equipment,\textsuperscript{164, 165} and tax incentives for employers who provide their employees with fitness facilities;\textsuperscript{164}
  \item Fiscal policies that discourage urban sprawl and encourage densification and active commuting;\textsuperscript{164} and
  \item Policies that support income equity and support,\textsuperscript{164, 166} given the probable influence of economic settings on body weight.
\end{itemize}

\textsuperscript{iii} The views expressed in this report do not necessarily represent the views of the Canadian Population Health Initiative or the Canadian Institute for Health Information.
Physical Environments

• Policies to review municipal by-laws and facilitate active transport by creating streets that incorporate pedestrian use and bicycle facilities and that are “calmed” (discourage high-speed vehicle traffic);164, 166

• Development plans that encourage the use of active transportation, family-oriented parks and sports facilities for adults;159, 164

• Collaboration with private- and public-sector employers to develop a workplace environment that promotes healthy weights;164, 167

• Policies to support comprehensive school health initiatives;167

• Policies to support the availability of a wider selection of healthy food choices in schools, work-sites, restaurants, fast food franchises and other community settings;158

• Policies to increase community access to exercise facilities, such as those in schools, to enhance opportunities for adults and children to participate in regular physical activity;158 and

• Policies to regulate portion size and disclosure of nutritional content on snacks and fast foods at point of sale and on product labels.164

Socio-Cultural Environments

• Policies that regulate the advertising and promotion of foods for children;159, 164, 165, 167, 168 and

• Policies to encourage large-scale community-based program models that support healthy weight activities based on strong community involvement,158 including but not limited to ethnic communities.

Political Environment

• Policies to monitor the impact on obesity and health of decisions in non-health sectors, such as education, transportation, food and recreation.166

3.8 Results of Online Stakeholder Survey

As stated in the Methodology section, we surveyed a group of over 90 decision-makers and researchers who attended a think tank session on obesity-related policy research priorities. Individuals representing regional health authorities, provincial and federal organizations and academics attended this two-day event. Those stakeholders interested in our research project responded to a web-based questionnaire (Appendix D). The first question in the stakeholder survey asked respondents to list up to three factors that are most likely to have an impact on healthy weights in an urban environment. All 24 respondents filled in this question and supplied three factors each for a total of 72 total answers (though six answers were placed in two different categories and one was not categorized due to lack of information, for a total of 77 responses).
Redefining the respondents’ answers in our adapted settings and sectors framework posed some challenges, as not all of the answers given fell neatly into one category (for example, some could fit in more than one category). However, an attempt was made to categorize the responses in our settings and sectors framework to make a more appropriate comparison between stakeholder responses and what was found in the systematic review.

Most respondents’ answers were grouped within the settings rather than the broader sectors category (see Appendix H). This suggests that respondents may feel the more immediate surroundings rather than broader societal trends and/or policies have a greater impact on healthy weights. The physical setting was the category for the most responses (n = 33; 43%). Most of these responses included presence of sidewalks, pathways, recreation facilities and food outlets. It should not be surprising that physical settings was the most common response category since the question, which contained the phrase “urban environment,” may have led people to think immediately about the built environment. Related to the physical setting is the physical sector, which was the next most common response category (n = 19; 25%). The responses in this group included any urban design or built environment answers, along with public transportation. The socio-cultural setting was the next most common category (n = 9; 12%), where responses varied considerably. Listed in this category were social networks, safety (not specific to safety of a physical setting), education, work–life balance, individual attitudes and car use (signifying the choice to use automobiles). Five responses (6%) were grouped to the economic sector and included socio-economic themes as well as energy prices. The political sector was the next most common response category (n = 4; 5%), where responses included policies or zoning around land-use planning that support car dependence. The economic setting also included four responses (5%) that dealt mainly with the affordability of food options. Two responses (3%) were categorized in the socio-cultural sector, where respondents listed sedentary lifestyles and a culture that supports car dependency. Finally, one response (1%) was in the political settings category and included education given in schools around healthy weights.

The second question asked whether the factors listed in question one were modifiable by a policy response. All 24 respondents filled in this question, although some responses were put into two categories for a total of 77 answers. The majority of respondents stated that the factors were modifiable by a policy response (69 of 77 answers; 90%).

Similar to the first question, the settings and sectors framework was used to determine which of the responses in question 2 were modifiable by a policy response. Most of the responses categorized in physical settings (32 of 33; 97%) were thought to be modifiable. These factors represented the accessibility of fitness and nutrition options generally in the local environment. One respondent was not sure whether the availability of calorie-dense food was modifiable.

The factors in the economic setting (4 of 4; 100%) and political setting (1 of 1; 100%) were thought to be modifiable. Only six of nine responses (67%) in the socio-cultural setting were thought to be modifiable by a policy response. Two responses focused on the theme of safety and security, and one respondent was not sure if social support was modifiable.
All 17 (100%) responses in the physical sector were thought to be modifiable by a policy response. These responses were centred mostly on urban design and public transportation. Four out of five (80%) responses in the economic sector were thought to be modifiable by a policy response. (One respondent was not sure if socio-economic levels were modifiable.) All (4 of 4; 100%) political sector responses were thought to be modifiable and were centred on policies and zoning of land use. Only one of two (50%) responses in the socio-cultural sector was thought to be modifiable. (One respondent was unsure whether sedentary lifestyles were modifiable.)

Based upon responses to question 2, factors in the physical settings and sectors were thought to be amenable to a policy response. The only factors thought to be unmodifiable were related to safety. Stakeholders responded strongly that policy changes affecting settings and sectors could lead to healthier body weights.

The third question in the survey asked respondents to list up to three policies/programs/initiatives that exist in urban areas to assist populations in achieving healthy body weights. A total of 52 responses were tallied for this question. (Two were classified into more than one category for a total of 54 answers.) The responses to this question were more challenging to group into settings and sectors because some respondents gave very specific initiatives in a geographic area and others gave broader factors that were similar to the answers found in question 1.

Classifying the responses in question 3 into the settings and sectors framework produces a much different breakdown than was seen in questions 1 and 2. The category with the most responses was in the political sector (n = 18; 33%) and the responses varied from specific initiatives (for example, Quebec City’s sustainable development plan, Healthy Ontario 2010) to more generic answers, such as policies favouring a change in retail mix or snow-clearing policies. Similarly the political setting had a large number of responses (n = 11; 20%) that included specific policies in workplaces (for example, Bristol-Myers Squibb’s quality-of-life policy, physical education in schools) to the more generic (for example, community use of schools). Other categories included nine responses for physical settings (17%), five for socio-cultural sectors (9%), four for socio-cultural settings (7%), four for physical sectors (7%), two for economic settings (4%) and one for economic sectors (2%).

In conclusion, most stakeholders responded that urban design issues and accessibility of physical activity and nutrition opportunities (mainly in the physical setting and physical sector) were the most important factors influencing healthy body weights in an urban environment. Most stakeholders believed that the majority of factors, no matter the specific setting or sector, are modifiable by a policy response, though the type of response was not specifically asked for. Of the initiatives that people knew about, most were classified into the political sectors and political settings.
4 Conclusions

In response to our research question (that is, to what extent do structural or community-level characteristics of urban environments encourage or inhibit the achievement of healthy weights?), this review revealed some evidence for associations between aspects of the urban environment and obesogenic behaviour and/or obesity/healthy weights. The strongest levels of evidence were observed for physical (diet), economic (diet, physical activity, obesity/healthy weights) and socio-cultural (diet, sedentary behaviour, obesity/healthy weights) settings, and physical (physical activity), economic (diet, physical activity, sedentary behaviour) and socio-cultural (diet, physical activity, obesity/healthy weights) sectors. Very little evidence existed for the effectiveness of interventions in achieving healthy weights in an urban context (see tables 2 and 3 on page 27).

A large proportion of the findings, particularly for physical activity and sedentary behaviour, were in the physical settings and sectors. Though the level of evidence was probable for diet (observational and experimental) and sedentary behaviour (observational) in the physical settings, less support was found for physical activity and body weight. According to the stakeholder survey of researchers and decision-makers, urban design and accessibility to physical activity and healthy nutrition opportunities were the most important factors influencing healthy body weights in an urban environment. Thus, some discrepancy appears to exist between the perceptions of these decision-makers and the state of the evidence with regard to the role of the physical environment in relation to healthy weights. For a more complete summary on the role of the built environment, please refer to the review articles by Swinburn et al., Frank and Engelke, Booth et al.,

and Ogilvie et al., In particular, the review by Booth et al. brings attention to the difficulty in comparing results from different studies because of the variability in methods used. However, their review of mostly cross-sectional studies clearly suggests that the built environment, most often assessed at the level of the neighbourhood, has the potential to influence body weight. Our systematic review is in general agreement with Booth et al., however, it is important to note that a large proportion of the findings we identified did not reach statistical significance. This may suggest that access to a supportive physical setting may be advantageous, but insufficient by itself to have a significant impact on obesity.

Though experimental evidence is lacking, the strength of the evidence for economic settings and sectors suggests that interventions aimed at improving SES and education levels within urban environments may help address disparities in obesogenic behaviour and obesity.

Perhaps one of the more striking findings in this review was the lack of evidence for the role of political settings and sectors in relation to obesity/healthy weights in the urban context. With regard to the policy analysis conducted, a large number of policy responses were identified in relation to obesity and the environment, but relatively few have been systematically tested. Thus, in addition to a gap in knowledge about the complex relationships among factors contributing to obesity, there is also a knowledge gap about the impact of possible policy responses.
Furthermore, a need exists for a better understanding of how the urban environment may influence the prevalence of obesity. This may be particularly true for the school setting, where several interventions have improved physical activity and nutrition knowledge/behaviours without having a significant impact on obesity. Conversely, at least one study achieved reductions in BMI without demonstrating increased physical activity or reduced dietary fat intake.27 Several reviews, some of which are systematic, have been recently published in this area.170–173 Although these reviews are not focused on the urban environment, they can provide important insight on school-based interventions.

Limitations

While there may be others, this report has two limitations that should be mentioned. First, the use of a vote-counting procedure in which findings were categorized and aggregated based upon statistical significance and direction of the relationship/change has been criticized in the past.174 Potential concerns with this approach are that, regardless of sample size, findings from various studies are attributed equal weight and that statistical significance, which is heavily influenced by sample size, is the only indicator of worthiness of a finding from a quantitative study. Thus, some large and meaningful findings in quantitative studies may have been passed over because they arose from small sample sizes and thus did not achieve statistical significance. On the other hand, this approach did allow for the inclusion of qualitative data, which we see as a strength. Second, because our review included four dependent or outcome variables (diet, physical activity, sedentary behaviour, healthy weight) and multiple levels of the environment, studies often contributed multiple findings to the analysis. Thus, the finding as opposed to the study was the unit of analysis. Therefore, it is possible that a study contributing numerous findings that are related to one another (that is, same sample) within an outcome, and perhaps even within the same level of the environment (for example, multiple measures of the built environment), could skew the results. That is, while we may have had 20 or 30 findings within a particular level of the environment for an outcome, it is possible that those findings were mostly from two or three studies. From a statistical point of view, this would be problematic because a major assumption of most statistical tests is that findings within a sample are independent of one another. It is also problematic because our confidence in the levels of evidence was based upon the number and proportion of findings that showed some association between the outcome variables and levels of the environment. Having numerous findings from the same study would limit our confidence. To address this issue, we were cautious in our reporting if we saw the findings of one study dominating the results for a specific level of the environment.

Summary

In summary, some evidence exists for associations between aspects of the urban environment and obesogenic behaviour and/or body weight, implicating interventions in policy and practice. However, the lack of evidence for effective interventions and policy initiatives suggests a need for research to fill knowledge gaps.
Reference List


173. C. D. Summerbell et al., ”Interventions for Preventing Obesity in Children,” *Cochrane Database of Systematic Reviews*, 3 (2005).

Appendix B: Sample MEDLINE/HealthStar Search Strategy

1. obesity/ or obesity, morbid/ or body weight/
2. body mass index/
3. energy intake/
4. motor activity/ or walking/ or bicycling/
5. Exercise/
6. leisure activities/ or recreation/
7. body weight/ or body weight changes/ or weight gain/ or weight loss/ or thinness/
8. diet/
9. feeding behavior/ or food habits/ or food preferences/
10. fruits/ or vegetables/
11. carbonated beverages/
12. dietary fats/ or dietary carbohydrates/ or candy/
13. menu planning/
14. or/1–13
15. (obes$ or bodyweight or body weight or overweight).ti,ab.
16. (physical$. adj5 (activ$ or inactiv$ or fit or fitness)).ti,ab.
17. sedentary.ti,ab.
18. (walk$ or bicycl$).ti,ab.
19. ((food or diet$) and (choice$ or choose or prefer$ or intake or habit$)).ti,ab.
20. (fruit$ or vegetable$).ti,ab.
21. (carbonated adj3 (drink$ or beverage$)).ti,ab.
22. (soft drink$ or soda or pop).ti,ab.
23. (junk food$ or fast food$ or snack$ or candy or high fat or sugary).ti,ab.
24. portion$.ti,ab.
25. or/15–24
26. 14 and 25
27. *obesity/ or *obesity, morbid/ or *body weight/
28. *body mass index/
29. *energy intake/
30. *motor activity/ or *running/ or *swimming/ or *walking/
31. *Exercise/
32. *leisure activities/ or *recreation/
33. *body weight/ or *body weight changes/ or *weight gain/ or *weight loss/ or *thinness/
34. *diet/ or *feeding behavior/ or *food habits/ or *food preferences/
35. *fruits/ or *vegetables/
36. *dietary fats/ or *dietary carbohydrates/ or *candy/
37. *menu planning/
38. or/27–37
39. (obes$ or bodyweight or body weight or overweight).ti.
40. (activ$ or inactiv$ or fit or fitness or sedentary).ti.
41. (walk$ or bicycl$).ti.
42. ((food or diet$) and (choice$ or choose or prefer$ or intake or habit$)).ti.
43. (junk food or fast food or snack$ or high fat or sugary).ti.
44. (fruit$ or vegetable$ or soft drink$ or soda or pop).ti.
45. portion$.ti.
46. or/39–45
47. 26 or 38 or 46
48. health policy/ or nutrition policy/ or policy making/
49. exp Public Policy/
50. exp organizational policy/
51. social change/
52. exp socioeconomic factors/ or educational status/ or employment/ or unemployment/
    or exp workplace/ or family characteristics/ or income/ or occupations/ or exp poverty/
    or exp social class/ or social conditions/
53. culture/ or acculturation/
54. social marketing/ or “marketing of health services”/
55. marketing/ or advertising/
56. persuasive communication/
57. Reimbursement, Incentive/
58. exp INSURANCE, HEALTH, REIMBURSEMENT/
59. taxes/ or income tax/ or tax exemption/
60. exp LEGISLATION, FOOD/
61. liability, legal/
62. politics/
63. Food Industry/
64. exp Food-Processing Industry/
65. food packaging/ or food labeling/
66. Food Dispensers, Automatic/
67. Restaurants/
68. Curriculum/
69. Schools/
70. School Health Services/
71. Food Services/
72. Government Programs/
73. Financing, Government/
74. National Health Programs/
75. mass media/
76. social planning/ or environment design/
77. Social Environment/
78. transportation/ or motor vehicles/
79. human engineering/
80. (public transit or transit system$ or bus or buses or bussing).ti.
81. ((sociodemographic$ or demographic$ or environment$) adj5 (factor$ or influence$ or barrier$)).ti.
82. or/48–81
83. urbanization/
84. urban population/ or urban health/
85. city planning/ or urban renewal/
86. residence characteristics/ or geographic information systems/
87. (urban$ or civic or city or cities or suburb$ or municipal$ or commut$
     or neighborhood$ or neighbourhood$).ti,ab.
88. exp SUBURBAN HEALTH SERVICES/ or exp SUBURBAN HEALTH/
     or exp SUBURBAN POPULATION/
89. exp Urban Health Services/
90. or/83–89
91. 47 and 82 and 90
92. 47 and 90
93. 82 or 90
94. 47 and 93
95. limit 94 to humans
Appendix C: Article Coding Form and Reference Guide

Author(s): Date of Publication:

Title:

Reviewer: Journal:

Step 1: Main Criteria for Abstract Scan

1. Does this article focus on one or more of the following themes: Diet/Food, Physical Activity, Sedentary Behaviour, Healthy Weights/Obesity as they pertain to effects on populations?
   - [ ] Yes
   - [ ] No
   - [ ] Unknown/Needs Follow-Up

2. Are environmental factors (i.e. settings, sectors) addressed?
   - [ ] Yes
   - [ ] No
   - [ ] Unknown/Needs Follow-Up

3. Does this article include Urban populations?
   - [ ] Yes
   - [ ] No
   - [ ] Unknown/Needs Follow-Up

- [ ] Keep for suggested references/follow-up
## Step 2: Full Review Coding and Assessment

4. Article Findings Coding Form

<table>
<thead>
<tr>
<th>Study ID</th>
<th>Finding #</th>
<th>Behaviour</th>
<th>Sex</th>
<th>Ethnicity</th>
<th>Age</th>
<th>SES</th>
<th>SES Detail</th>
<th>Environment Setting</th>
<th>Environment Sector</th>
<th>Finding Direct.</th>
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<tbody>
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<td>Phys</td>
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<td>Poli</td>
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</table>
5. Study Design:

☐ A1—Systematic reviews which contain at least one randomized control trial

☐ A2—Other systematic and high-quality reviews

☐ B1—Individual randomized controlled trials; randomized experimental studies

☐ B2—Non-randomized, experimental studies

☐ B3—Well-designed, nonexperimental studies, controlled statistically if appropriate, also includes well-designed qualitative studies

☐ C1—Descriptive and other research (e.g. convenience samples) not in B

☐ C2—Case studies and examples of good practice

6. Article Feature Quality: Place an “X” in the box that best describes each article’s features.

<table>
<thead>
<tr>
<th>Study Feature</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Very Poor</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Method and Data</td>
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<td>2. Sampling</td>
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<td>3. Data Analysis</td>
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<td>4. Ethics and Bias</td>
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<td>6. Transferability/Generalizability</td>
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<td><strong>Total</strong></td>
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</table>
Coding Reference and Definitions

Main Criteria for Abstract Scan

1. Does this article focus on one or more of the following themes: Diet/Food, Physical Activity, Healthy Weights/Obesity as they pertain to effects on populations?
   - This question is assessing whether the study in question is examining population-level effects of one of the listed topic areas. Literature excluded using this criteria would include those that address these topics independent of populations (e.g. “Changes in Nutrient Content of Lettuce from 1975–2000”) or not explicitly focused on populations (e.g. “A Survey of Grade-School Physical Education Programs”).
   - Included studies should be explicitly focused on obesity, but can also explore any related health conditions (i.e. cancers, cardiovascular diseases, respiratory conditions, disabilities, etc.).

2. Are environmental factors (i.e. settings, sectors) addressed?
   - This question examines whether the study focuses on community-level settings or structural sectors. These include physical environments, economic environments, political environments and socio-cultural environments. Examples of papers that would be accepted might be: “The Accessibility of Grocery Stores in an Urban Centre”; “Economic Barriers to Physical Activity”; “Does Increased Stairwell Lighting Increase Usage in the Workplace?”; or, “The Impact of a School Feeding Program on Childhood Obesity.”
   - Studies not included using this criteria would be those in which the location or setting of the study is not a primary focus of the work. For example, although a clinical trial may take place in a hospital, the study will not be included unless the hospital, as a workplace, was included in the study as a primary focus. Similarly, a paper that examines a population of children recruited from an elementary school would be excluded unless this environment is a primary focus for the paper (e.g. “The Effect of School Food Policy on Purchasing Behaviour of Junior High Students”).

3. Does this article include Urban Populations?
   - From the abstract, it should be possible to determine whether the population of interest in a study is from an urban area. Often, research being reported was conducted at universities, which are generally located in urban centres. If not, the paper should specify where it has been conducted. If the origin of the population is not specified, the study will need to be followed up.
Appendix C: Article Coding Form and Reference Guide

Notation Instructions for Abstract Scan
Consistency in the notation used during the abstract scan stage is important if the review is to run smoothly. Each reviewed abstract must be marked in such a way that it is clear whether the article has been rejected, accepted, or requires follow-up.

- Ensure all notation is placed to the left of the abstract.
- List 1, 2 and 3 to correspond with the three questions under Step 1 of the Assessment Tool.
- Beside each number, place either “Y” or “Yes” for Yes, “N” or “No” for No, or “U/FU” for Unknown/Needs Follow-Up, depending on the appropriate assessment for that particular abstract. Please do not use question marks, or any other marks other than those listed above—if you are unsure of the proper response to a particular question, mark it as unknown and it will be followed-up.
- Underneath these three criteria, clearly mark an “X” if the article is being rejected; a “✓” if the article has been accepted for full review with no reservations; or “Follow-Up” if the article needs further review to determine its status.
- If the article has been rejected or if it requires follow-up, write a very brief note explaining the reason for this assessment. For example, “No environmental factors” or “No effect of diet/obesity/physical activity on populations” would be sufficient here. Similarly, provide a brief note describing any criteria that require follow-up, using a similar format to that described above.
- If the article has been rejected but is perceived as being valuable in terms of its content, conceptual contribution to the field, potential references etc., clearly note this underneath the other assessments. “Follow-up for suggested references” or “Follow-up for conceptual content” would be sufficient here.

Conceptual Framework—Sectors and Settings

Settings
For this review, settings are community-level factors that play a role in influencing body weights in the urban environment. Settings can be classified into four distinct types (physical, economic, political, socio-cultural)—definitions and examples pertaining to each of these types are given below.

1. Physical: Physical environmental factors refer to the built environment of the urban area. Specific examples here would include the distribution of food and physical activity amenities, including the placement of grocery stores or restaurants and walking/biking trails, as well as urban planning issues such as public transportation systems. In many cases, papers in this category will concern the physical availability or accessibility of a particular amenity.

2. Economic: Economic environmental factors incorporate a financial aspect into the concepts of availability and accessibility. The most common theme for this setting is the affordability of a particular item, be it food from supermarkets and restaurants, or sources of physical activity like gyms or recreation centres.
3. Political: Political environmental factors are those that explore policies at the more personally oriented (i.e. micro) levels. These can include food and physical activity policies at schools, workplaces, or even of individual people.

4. Socio-Cultural: Socio-cultural environmental factors are slightly more ambiguous, exploring trends, perceptions and feelings towards food, physical activity or obesity at a slightly broader level. Papers here may explore cultural barriers to participation in physical activity or of purchasing healthy foods for a specific ethnic group, or the role of the family environment in promoting healthy eating or physical activity. Particular attention should be paid to papers falling into this category in terms of the distinction between this setting and the broader structural sectors listed below—the main difference is that papers in this category will pertain to a specific ethnic group or family environment, for example, instead of being concerned with all families or all ethnicities.

Sectors
For this review, sectors refer to broader structural factors that surround the more specific settings described above. These will be predominantly concerned with population-level explorations and analyses of the four environment types.

1. Physical: Physical environmental sectors can explore things such as general trends in urban planning relative to physical activity or food; the role of technology and automation in people’s daily lives; or the impact of transportation systems on a population level.

2. Economic: Economic environmental sectors, similar to the description of economic settings above, concerns financial aspects of obesity, physical activity and/or eating at a population level. For example, papers here may explore the impact of socioeconomic status on participation in physical activity or food consumption patterns, or might provide an analysis of economic subsidies or market forces as they pertain to the availability of food.

3. Political: Papers concerning political environmental sectors are likely to explore topics such as the impact of specific policies on food costs or availability, funding decisions for population-level education programs or services, or how government taxation or subsidization factors into any aspect of healthy weights.

4. Socio-Cultural: Examples of socio-cultural environmental sectors would include the impact of globalization or other major population-level trends on obesity, or cultural acceptability of obesity.

Study Design
Systematic Review—a synthesis of the results of a number of comparable studies to determine the overall state of the literature for a particular topic. Meta-analysis is a method of systematically reviewing comparable quantitative literature.
Randomized Control Trials (RCTs) — RCTs are the “gold standard” in medical and other types of research. Subjects are randomly assigned to either a “treatment” (receiving experimental condition) or “control” (receiving no treatment or standardized alternate treatment) group. Investigators and subjects are often “blinded” to which group they are assigned, in order to limit or eliminate bias. Following the application of the experimental treatment(s), the two groups are followed-up and compared. RCTs are desirable because they minimize external biases and allow for most of the differences to be attributable to experimental conditions.

Experimental Studies — similar to RCTs described above, but without many of the controls. Two or more groups of subjects are compared, but may not be randomly assigned to experimental conditions; investigators and subjects may not be blinded; samples may not be randomly chosen from a larger population. An experimental study lacking these controls may be susceptible to confounding variables, which can weaken the relationship between the actual experimental variable and the observed outcomes (i.e. differences between experimental conditions may not be caused by the experimental condition, but something else).

Nonexperimental Studies — studies where there are no comparisons between groups—only one group is observed and/or given an experimental treatment. Often a group of subjects is assessed on some dimension at the beginning of the study (baseline), given an experimental treatment, and then assessed again afterwards (pre-post design). A common nonexperimental design is the cross-sectional approach, which takes a “snapshot” of several different groups of subjects (e.g. across age categories, ethnicities, etc.) at the same time using the same method. Often these types of studies emerge from secondary analysis of data from a larger population survey, such as NHANES (U.S.), Canadian Community Health Survey (CCHS; Canada), or similar large-scale European surveys. Many qualitative studies fall into this category as well, including observations, interview studies and case studies.

The second category of nonexperimental studies (C1) includes descriptive research and less-strongly designed studies of the type described above. For example, a small one-time survey or observation that does not account for many potential biases (e.g. population effects, time-of-day effects) would be included in this category. These studies often sample based on the convenience of soliciting participants with some desired characteristic(s), rather than focusing on controlling these biases through random selection. Another major difference between these studies and those in B3 is that the ability of the reviewer to make any conclusions concerning the validity and reliability of the study is limited as the number of potential biases increases.

Case Studies and Examples of Good Practice — case studies are generally an in-depth description of a single person, place or object. Examples of good practice might encompass case studies of relevant policies and/or descriptions of practically applied research.
Article Feature Quality Assessment Guide

1. Method and Data: Is the method appropriate and clearly explained?
   - Good: Method is appropriate and described clearly (e.g., questionnaires included). Clear details of the data collection and recording
   - Fair: Method appropriate, description could be better. Data described
   - Poor: Questionable whether method is appropriate. Method described inadequately. Little description of data
   - Very Poor: No mention of method AND/OR method inappropriate AND/OR no details of data

2. Sampling: Was the sampling strategy appropriate to address the aims?
   - Good: Details (age/gender/race/context) of who was studied and how they were recruited. Why this group was targeted. The sample size was justified for the study. Response rates shown and explained
   - Fair: Sample size justified. Most information given, but some missing
   - Poor: Sampling mentioned but few descriptive details
   - Very Poor: No details of sample

3. Data Analysis: Was the description of the data analysis sufficiently rigorous?
   - Good: Clear description of how analysis was done. Qualitative studies: Description of how themes derived/respondent validation or triangulation. Quantitative studies: Reasons for tests selected hypothesis driven/numbers add up/statistical significance discussed
   - Fair: Descriptive discussion of analysis
   - Poor: Minimal details about analysis
   - Very Poor: No discussion of analysis

4. Ethics and Bias: Have ethical issues been addressed, and has necessary ethical approval been gained? Has the relationship between researchers and participants been adequately considered? Assessment should reflect both the description within the article, as well as how these issues actually affect the article being assessed.
   - Good: Ethics: Where necessary issues of confidentiality, sensitivity and consent were addressed. Bias: Researcher was reflexive and/or aware of own bias
   - Fair: Brief mention of issues
   - Poor: Lip service was paid to above (i.e., these issues were acknowledged)
   - Very Poor: No mention of issues
5. Results: Is there a clear statement of the findings?

<table>
<thead>
<tr>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Very Poor</th>
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<tbody>
<tr>
<td>Findings explicit, easy to understand, and in logical progression. Tables, if present, are explained in text. Results relate directly to aims. Sufficient data are presented to support findings.</td>
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<tr>
<td>Findings mentioned but more explanation could be given. Data presented relate directly to results.</td>
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<tr>
<td>Findings presented haphazardly, not explained, and do not progress logically from results.</td>
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<tr>
<td>Findings not mentioned or do not relate to aims.</td>
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6. Transferability or Generalizability: Are the findings of this study transferable (generalizable) to a wider population? Like Question 4, this assessment should factor in both the description in the text as well as what the generalizability/transferability of the article actually is.

<table>
<thead>
<tr>
<th>Good</th>
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<th>Very Poor</th>
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<tbody>
<tr>
<td>Context and setting of the study is described sufficiently to allow comparison with other contexts and settings, plus high score in Question 2.</td>
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<tr>
<td>Some context and setting described, but more needed to replicate or compare the study with others, PLUS fair score or higher in Question 2.</td>
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<tr>
<td>Minimal description of context/setting.</td>
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<tr>
<td>No description of context/setting.</td>
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</table>

**Article Coding Index**

*Note:* Step 1 will not be coded, because all articles advancing to the full review stage will all have the same results for this step.

**Step 2: Literature Coding Assessment**

Study Design: \( \text{A1} = 1, \text{A2} = 2, \text{B1} = 3, \text{B2} = 4, \text{B3} = 5, \text{C1} = 6, \text{C2} = 7 \)

Article Feature Quality: Each of the six article features should be coded using the following scale—Good = 1, Fair = 2, Poor = 3, Very Poor = 4

**Step 3: Full Article Review Coding**

Study ID: the first author’s last name plus the last two digits of the year it was published (e.g. Smith95).

Finding #: for each particular study, there may be a series of findings that are presented. Because each of these findings is to be captured separately, a number needs to be assigned to each one to keep them in order.
Behaviour: This corresponds to the four themes of the review—Diet/Nutrition (1), Physical Activity (2), Obesity/Healthy Weights (3), and Sedentary Behaviour (4).

Sex: Male (1), Female (2), Both (3) or Not Distinguished/Applicable (4).

Ethnicity: The ethnicity of the participants being researched in the study. Some examples include Caucasian/White (1), Black (2), Hispanic/Latino (3), Aboriginal/Native (4), Other (5) or Not Distinguished/Applicable (6).

Age: The general age of the participants being researched. The range of codes included here would have Young Children (1), Adolescents/Teenagers (2), Adults (3), Older Adults (4), Not Distinguished/Applicable (5).

SES: The socioeconomic characteristic of the finding being reported. Codes will include Income (1), Education (2), Employment (3), Composite/Index (4), or Not Distinguished/Applicable (5) with space in the “detail” column to provide more information about what is being examined.

Environment Setting/Sector: This section will indicate which of the listed settings and sectors are being examined in the article. Place the numeral 1 in the box that corresponds to the environmental setting or sector associated with that particular finding, and place a 0 in the other settings and sectors to show that they aren’t being examined. In the “Detail” box, please note the specific setting or sector under examination (e.g. “school”).

Finding Direction: This box will note what the direction of the finding is, as outlined on page 7 of the project proposal. The codes here will be as follows: No Association (0); Negative Association (1); Direct, positive association (2); U-shaped Association (3).

**General Notes About Coding:** The general format for coding a study begins with determining how many findings need to be reported. Often times studies will report results for more than one group of participants (e.g. men and women; African-American, Caucasian and Hispanic), or for more than one level of analysis (e.g. multilevel studies that examine participants within a neighbourhood context). These studies can sometimes include more than one of these divisions (e.g. African-American men, African-American women, Caucasian men, Caucasian women); thus, findings need to be reported for all of these populations. A line in the coding sheet (and subsequently, in the database) will be created for each of these distinct populations or environments; for the example above with African-American and Caucasian women and men, 4 lines on the coding sheet must be used to report this information. Should the same paper include multi-level modeling, for example looking at the same population at the individual and community levels, 8 lines will need to be recorded.

The point of constructing the coding this way is to be able to empirically analyze the relationships between any one of the listed populations and/or environmental settings (e.g. research demonstrates that in 7 of 10 studies, the body weight of Aboriginal men is adversely affected by the physical environment).
Some other points:

- An article will sometimes report more than one measure of the behaviour in question (e.g. physical activity—self-reports, accelerometers, etc.). In a case like this, first determine if there is a general pattern across all measures of the behaviour (e.g. both self-reports and accelerometers result in the same direction); if there is discord between two or more behaviour measures, separate the two measures into two findings and make a note of the discrepancy in the database in the “details” section of the environmental setting/sector.

- If there is no significance reported for a trend presented in a set of results, or if a finding is not reported as significant in the text of the article, report the finding direction as “no association.” It is likely that authors will highlight the significant results of their work in the results or discussion sections of the paper, so report finding directions based on this assumption. Should a case like this arise, be sure to rate the quality of the article’s results accordingly (i.e. lower than if the results were completely reported/explained).

- Similarly, qualitative papers do not have the luxury of statistical significance to aid in determining the direction of a finding. For these papers, look again to the results and discussion sections to see what trends were strong enough to be reported.

- The issue of coding socioeconomic status is potentially problematic. Since SES can be researched and reported in many different ways and on many different levels, these guidelines will undoubtedly be modified as the review progresses. However, here are some basic guidelines:
  - Many studies, especially those that look at more population-level statistics, use a composite indicator or index to represent SES (e.g. deprivation index). A new code has been created to capture these, as well as other indicators of socioeconomic status other than the traditional income, education and employment.
  - There was some confusion as to how SES should be coded, and this largely depends on the way SES is being examined in the study. If SES is being reported or compared across a number of groups and is the major focus of the analysis being undertaken, it should be coded as an environmental setting or sector. More specifically, in the case that SES is reported as a variable across a sample of people, it is classified as an environmental sector. If SES is one variable of a cross-sectional-type data set, it should be coded in the SES column using one of the previously defined codes (income, education, etc.). For example, if SES is examined as a characteristic of a neighbourhood or community, the SES column is where this should be coded.

- Cases will arise where more than one level of results will be reported; for example, gender-stratified results could be given for females, males and for both groups together. We would like to only capture the most detailed level of results, so only the female and male results will be recorded and not the two groups together.
• Measures of physical fitness are not being recorded here.

• Sedentary behaviour is not the same as “reverse” physical activity—the two are mutually exclusive. As such, a new code has been created to capture studies that look at sedentary behaviour.

• Variables like role modeling, family environment and supportive environments should be coded as socio-cultural sectors or settings.
Appendix D: Online Stakeholder Survey

We are conducting a state of the evidence review on urban environments and healthy body weights. This survey is intended to supplement a literature review by gathering the knowledge and opinions of a selected group of stakeholders from across Canada.

By completing this short survey, you are giving your consent to the project team to use the information collected from you for the purposes of this review. Your responses are completely anonymous. However, we will be conducting short follow-up interviews for the purpose of discussing your survey responses and the results of our literature review in greater depth. If you would like to participate in the follow-up interview process, you will be asked to provide your name and contact information at the end of this survey. Further information about the follow-up interviews will be provided at the end of the survey.

If you have any questions about this survey or the project, please contact the project research coordinator, Eric Hemphill, at 780-492-2027 or eric.hemphill@ualberta.ca.

If you’d like to leave the survey at any time, just click “Exit this survey”. Your answers will be saved and you will be able to return to the survey to complete it at a later point.

Next >>
2. Survey Questions

1. From your perspective, list up to 3 (three) factors that are most likely to have an impact on healthy weights in an urban environment.
   a. 
   b. 
   c. 

2. Are the factors listed in Question 1 modifiable by a policy response? Please choose 'yes', 'no', or 'not sure' for each factor that you listed in Question 1.
   Factor a (question 1)  
   Factor b (question 1)  
   Factor c (question 1)  

3. List up to 3 (three) policies/programs/initiatives that you know of that exist in/for urban areas to assist populations in achieving healthy body weights.
   a. 
   b. 
   c. 

4. Are you aware of evidence regarding the cost-effectiveness of the policies/programs/initiatives listed in Question 3? Please choose 'yes', 'no', or 'not sure' for each item you listed in Question 3.
   a. 
   b. 
   c. 

<< Prev  Next >>
3. Thank you

Thank you for taking the time to complete our survey. If you would like to participate in a more in-depth telephone interview, please give your contact information below. A more detailed information package will then be forwarded to you.

Please note that your completion of the online survey does not in any way obligate you to participate in a follow-up interview. If you choose not to participate in a follow-up interview, your survey responses will remain completely anonymous.

Name

Email

Telephone Number

<< Prev        Done >>
Appendix E: Bibliography of Assessed Literature


Evers, S. “Economic and Social Factors Associated With Obesity in Adult Canadians.”


State of the Evidence Review on Urban Health and Healthy Weights


Appendix F: Bibliography of Policy Documents


### Appendix G: Potential Policy Instruments Categorized Using the ANGELO Framework

<table>
<thead>
<tr>
<th>Physical Settings</th>
<th>Economic</th>
<th>Political or Policy</th>
<th>Socio-Cultural</th>
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<td>Micro/meso</td>
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<tr>
<td>environments</td>
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<td>Policy options</td>
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<td>that seem primarily</td>
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<td>regulatory in nature:</td>
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<td>Review of municipal</td>
<td>PA</td>
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<td>by-laws be undertaken</td>
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<td>discourage physical</td>
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<td>activity at the</td>
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<td>Facilitate active</td>
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<td>transport by creating</td>
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<td>that are “calmed”</td>
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<td>traffic).</td>
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<td>Implement development</td>
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<td>enhance opportunities</td>
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<td>for adults and children</td>
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<td>Help communities to</td>
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<td>easier for parents to</td>
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<td>make use of sports</td>
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<td>facilities or exercise</td>
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<td>Provide incentives</td>
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<td>basis.</td>
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<td>Encourage large-scale</td>
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<td>community-based program</td>
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<td>models that support</td>
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<td>healthy weight activities</td>
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<td>based on strong</td>
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<td>community involvement.</td>
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<td>Help start community</td>
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<td>programs for physical</td>
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<td>exercise and the adoption</td>
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<td>of realistic goals</td>
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<td>regarding weight and</td>
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<td>appearance.</td>
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*Note: The “EL” (Evidence Link) categories link the identified policy options with evidence described in tables 2 and 3 on page 27.*

**Notes:**
- FDN = Food, Diet and Nutrition; PA = Physical Activity; S = Sedentary Behaviour; BW = Body Weight.
- References for cited documents appear in the Reference List.
<table>
<thead>
<tr>
<th>Physical</th>
<th>EL</th>
<th>Economic</th>
<th>EL</th>
<th>Political or Policy</th>
<th>EL</th>
<th>Socio-Cultural</th>
<th>EL</th>
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<tbody>
<tr>
<td>Whole worksite interventions to facilitate health (incentive system)</td>
<td>BW</td>
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<td></td>
<td>Encourage schools, work-sites and community groups to develop and implement model programs promoting healthy weights</td>
<td>All</td>
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<tr>
<td>Whole school interventions to facilitate health</td>
<td>BW</td>
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<td>Encourage community-based demonstration projects, family-centred or at work-sites, with mutual aid or self-help groups</td>
<td>BW</td>
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<tr>
<td><strong>Policy options that seem primarily information-based:</strong></td>
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<td>Encourage voluntary organizations to develop programs and leadership training in promoting healthy weights</td>
<td>BW</td>
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<tr>
<td>Encourage politicians, developers and consumers to consider the importance of the relationship between urban design and obesity</td>
<td>PA</td>
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<td>Encourage workplace wellness and employee fitness programs that are supportive of the healthy weight concepts</td>
<td>PA, BW</td>
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<tr>
<td>Encourage collaborative, community-based efforts to promote policies to support the availability of a wider selection of healthy food choices in schools, work-sites, restaurants, fast-food franchises and other community settings</td>
<td>FDN</td>
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<tr>
<td>Work with private- and public-sector employers to develop a workplace environment that promotes healthy weights</td>
<td>All</td>
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### Appendix G: Potential Policy Instruments Categorized Using the ANGELO Framework

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<th>EL</th>
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<th>EL</th>
<th>Political or Policy</th>
<th>EL</th>
<th>Socio-Cultural</th>
<th>EL</th>
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<tbody>
<tr>
<td><strong>Transitional</strong> (That is, could be implemented in either settings or sectors)</td>
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<td>Policy options that are based on expenditure instruments:</td>
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<td></td>
<td>Fiscal policies to facilitate healthy lifestyles (food and recreation)</td>
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<td>Policy options that seem primarily information-based:</td>
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<td></td>
<td>Determine the impact on obesity and health of education initiatives, income support programs, and recreational initiatives</td>
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<table>
<thead>
<tr>
<th>Sectors</th>
<th>Macro environments or social structural conditions</th>
<th>Policy options that seem primarily regulatory in nature:</th>
<th>Policy options that are expenditure-based:</th>
<th>Policy options that seem primarily regulatory in nature:</th>
<th>Policy options that seem primarily information-based:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipalities be able to plan and raise revenue for sustainable urban design and transportation</td>
<td>PA</td>
<td></td>
<td>Adopt fiscal measures involving tax reductions for fees related to participation in sports</td>
<td>FDN</td>
<td>Regulating advertising time to ensure healthy foods receive equal time</td>
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<td></td>
<td>Develop a tax (similar to the GST/HST) to subsidize the cost of low-energy nutritious foods</td>
<td>FDN</td>
<td>A dialogue on the autonomy and authority of municipalities concerning obesity and health-related issues in Canada</td>
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<tr>
<td></td>
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<td>Policies that support adequate income</td>
<td>BW</td>
<td>Support the adoption of regulations to increase the number of hours of physical activity in schools</td>
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<td></td>
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<td>Promote policies that encourage food producers and manufacturers to provide foods of lower energy value and high nutrient value</td>
<td>PA</td>
<td>Regulation of advertising and promotion of foods for children (TV watching and advertising)</td>
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<td>Taxation policies to promote physical activity; removal of sales tax from exercise equipment; and tax incentives for employers who provide their employees with fitness facilities</td>
<td>PA</td>
<td>Start a campaign to change social standards leading to the population's understanding and integration of the idea of a healthy body weight</td>
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<th>Economic EL</th>
<th>Political or Policy EL</th>
<th>Socio-Cultural EL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Policy options that are expenditure-based:</strong> Taxes to discourage urban sprawl: congestion/traffic taxes, rush-hour tolls, subdivision fees, and gasoline taxes to encourage densification and active commuting(^{164})</td>
<td><strong>Policy options that are primarily information-based:</strong> Explore food insecurity in relation to obesity(^{166})</td>
<td>Restriction on junk food advertising during peak TV viewing times for children(^{164}, 167)</td>
<td>FDN</td>
</tr>
<tr>
<td></td>
<td>Research differences in obesity according to such factors as socio-economic status, region, and level of urbanization(^{166})</td>
<td>Legislation to regulate portion size and disclosure of nutritional content on snacks and fast foods at point of sale and on product labels(^{164})</td>
<td>FDN</td>
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<td></td>
<td>Determine the impact on obesity and health of education initiatives, income support programs, and recreational initiatives(^{166})</td>
<td>Development of a national school health program modelled on a program originally developed and implemented in 1995 (Pan-Canadian Curriculum)(^{166})</td>
<td>All</td>
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<td>Development of an official body, based within a larger public health agency, for monitoring school health(^{166})</td>
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<td></td>
<td></td>
<td>Investigate the impact on obesity and health of decisions in non-health sectors, such as education, transportation, food, and recreation(^{166})</td>
<td>All</td>
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Appendix H: Aggregate Results From Online Stakeholder Survey

Question 1: Three factors that impact healthy weights in an urban environment (Settings and Sectors analysis)

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Note: A total of 77 responses are included. One response was not included (“barriers to physical activity”) because of lack of information. Six responses were put into two categories.

Question 2: Are the factors in question 1 modifiable by a policy response?

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Note: Two responses were put into two categories, for a total of 54 responses.

Question 3: List up to 3 policies/programs/initiatives that you know of:

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<th>Political</th>
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<td>4</td>
<td>1</td>
<td>18</td>
</tr>
</tbody>
</table>

Note: Two responses were put into two categories, for a total of 54 responses.